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THE OIL AND GAS JOURNAL

Look at the Record

WE suggest a careful study of the 1946 annual statements of representative oil companies, keeping in mind probable trends this year in supply and demand. These annual financial summaries are not based on estimates or average industrial data but reflect actual operating conditions of individual companies, measured in dollars and cents.

We were particularly impressed the past week with the 1946 report of Humble Oil & Refining Co., largest domestic producer, buyer and pipe-line transporter of crude oil, and a major refiner and marketer of petroleum products. This company, fortunately for the war program, was able to double its crude-oil output from 1941 to 1944, accounting for a substantial part of the national increase required to win a world conflict.

Despite this war expansion the company, in order to conserve materials and manpower, reduced its drilling operations more than 50 per cent in 1943 compared to 1941, with 1944 well completions about 60 per cent of the prewar year. Because postwar demands from the start were near the peak war levels and in recent months substantially greater, the Humble company has found it necessary to maintain its 1945 field output.

To do this the Humble management has had to expand exploration and development drilling, and the results are clearly revealed by charts and data in its annual statement.

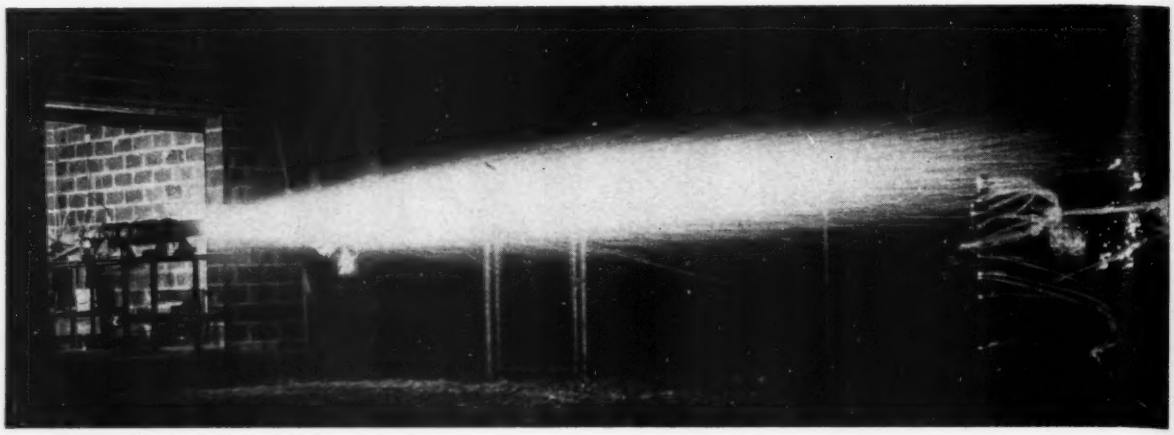
Humble drilled 585 wells last year, an increase of 16 per cent over 1941. But these 1946 wells, including the equipping of wells and leases, cost $60,000,000, nearly 300 per cent greater than in 1941. The number of dry holes jumped from 73 to 169 and the actual cost of last year's failures was six times that of 1941.

The proven reserves of the Humble company have kept pace with its large production but the statement makes clear that new pools are harder to find, deeper, and smaller in recoverable oil than they were prewar.

Humble's President Wiess emphasizes the decline in real income over the past 5 years from producing a barrel of crude oil. Its net income last year was $71,831,000, but in terms of 1935-1939 dollar values this income was equivalent to $52,000,000.

Much has been said outside the oil industry about last year's earnings of companies and individuals and more will be heard in coming months. These earnings in producing operations, without important exception, largely emanate from prewar discoveries and development operations. Entirely different results would be reported if present earnings were based on the present cost of finding oil. It should be apparent to everybody concerned, particularly consumers, that today's price levels must furnish the incentives for the discovery and development of tomorrow's oil.

PETROLEUM—A *PROGRESSIVE* INDUSTRY



Flame issues from the exhaust end of a ram-jet during a night test in connection with Standard Oil Development Co.'s Fuels of the Future program at its laboratories in Linden, N. J. Development work on the ram-jet is being done for the U. S. Navy in cooperation with Johns Hopkins University. About 6 in. in diameter, one jet releases heat equivalent to that of 300 domestic oil burners

Ultrahigh Octane Fuels Show 50 Per Cent Savings, Scientists Say

NEW YORK. — A car engine designed with a 12 to 1 compression ratio, to operate efficiently on essentially 100-octane-number motor fuel, will show a fuel saving of 50 per cent over an engine of 6.5 to 1 ratio to operate on current housebrand-quality fuels, R. P. Russell, president of Standard Oil Development Co., announced here. Such figures refute statements made recently that inadequate returns are had from the higher-octane-number fuels of today. The demand for a prototype turbo-jet engine fuel in the middle distillation range of petroleum may change somewhat the refinery yields at present, although these fuels will come from other portions of crude than that used to make motor and aviation fuels, Russell said. Modern refining methods, such as hydrogenation, can add 2 gal. of motor fuel to each 42-gal. barrel of crude, because of the hydrogen added during the process.

New and more efficient refining methods are indicated by present trends, Russell insisted. We are much nearer motor fuels from natural gas with two plants planned and/or building for this adaptation of the Fischer-Tropsch reaction. Similarly we can make motor fuels from asphalt, heavy fuel oil, tars, potatoes, sawdust, cabbages, and grain, he stated, by presently uneconomical but well-known processes. Turbo-jet and similar power plants now undergoing intensive research and development will continue and may be expected to power aircraft largely, in any future war; more than 50 per cent of crude may be converted to fuels for these engines, he stated.

By the end of World War II aviation fuel of better than 100/130 grade was available widely to the armed forces, it was stated before a large group of technologists and other visitors to Jersey's Elizabeth research plant. Army-Navy joint specifications are now being set at 115/145 and some commercial lines are expected to use this fuel grade in the more or less near future. The first of each pair of numbers indicates the test rating under lean mixture, the second indicates the extra horsepower turned up by the fuel under rich-mixture conditions, above a 100-octane-number conventional fuel. Diesel-engine weights can be reduced greatly and efficient, improved performance can be obtained if cetane numbers—ignition quality—are raised. Ignition promoters have been found which improve considerably the burning quality of diesel fuels, but none are known which are superior enough.

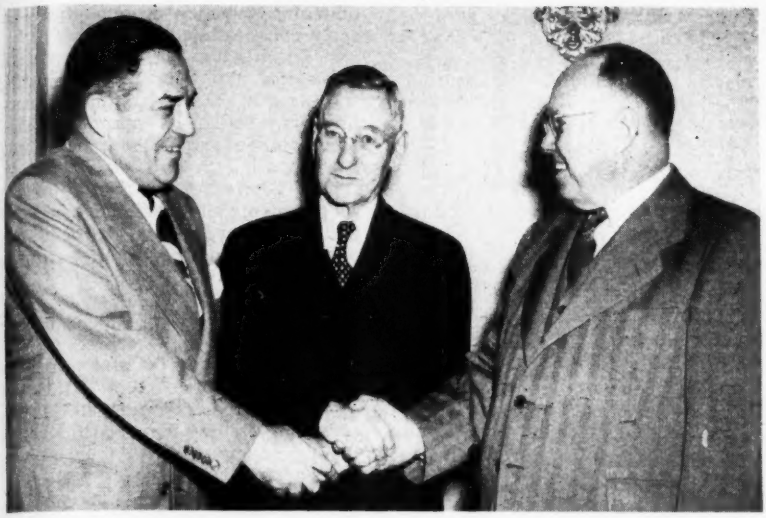
Qualities of Fuel

A fuel satisfactory for gas-turbine engines must burn cleanly, technologists stated, and must not deposit carbon or coke in the combustion chamber. Coke deposition shows combustion inefficiency, and may cause warping of chamber metal liners, reducing dissipation of heat, while large coke particles may damage turbine rotor blades seriously. Flame blowout control is another important problem for research to solve. Gas-turbine fuels now being studied and used range from 100-octane aviation fuels to kerosene. Those fuels in the higher boiling ranges are not entirely satisfactory in combustion chambers, and leave something to be desired in their low-temperature properties also. Aromatic fuels show less advantage than paraffinic, but because of their greater heat content per gallon, improvement in combustion-chamber and accessory design may permit use of aromatics. Experimental ram-jet engines are 6 in. in diameter by 12 ft. long and are called "flying stovepipes."

Tremendous amounts of fuel and air are consumed in a turbo-jet engine. At 375 m.p.h. an engine developing 4,000 lb. thrust shows 4,000 hp.; It uses more than 4,000,000 cu. ft. of air per hour, and 20 bbl.—840 gal.—of fuel per hour, enough to drive a motor car 12,000 miles at 60 m.p.h. Estimates of the time to elapse before turbo-jets are applied generally to commercial flying range from 3 to 10 years or longer in the future.

In a ram-jet engine the combustion air is compressed entirely by the pressure of the incoming air. The ram-jet is confined in application to supersonic speeds, that is, above about 750 m.p.h. It cannot take off by itself so must have outside aid; has no moving parts, and requires a special fuel which will burn efficiently at all ranges of speed and temperature.

The ram-jet's power-weight ratio is astounding. Short flights have been made at speeds exceeding 1,400 m.p.h., and at this speed it develops about 1 hp. for each ½ oz. of weight, more than 30 times as high as in an aviation engine. Flight time from New York to Pittsburgh would be reduced to about 15 minutes, or faster than the earth's rotational speed. Cabin cooling reaches major importance at these speeds, temperatures reaching 300° F. at 1,400 m.p.h., 650° at 2,000 m.p.h.



Congratulating National Petroleum Association's Recording Secretary Herbert G. Eaton, center, on his forty-fifth year with this association are C. J. Bauer, left, chief of the foreign petroleum-economics section, department of coordination and economics, Standard Oil Co. (N. J.), and Max W. Ball, director, Oil and Gas Division, Department of Interior. Both Bauer and Ball were featured speakers at the semiannual N.P.A. convention

World Demand Taxes Refining Capacity, Bauer Tells N.P.A.

by Warren W. Burns

CLEVELAND.—With approximately 400 oil men in attendance at the fourty-fourth semiannual meeting of the National Petroleum Association here April 17-18, the country's uncertain labor conditions again evoked the most intense general discussion. The same degree of interest was shown last year by N.P.A. members.

This year a round-table discussion on "The Outlook in Labor Relations" was highlighted by John D. Clark, a member of President Truman's Council of Economic Advisers, who told his audience that the United States is now following "the same detrimental economic pattern" as was followed at the close of World War I.

Sharing interest with labor problems were refinery discussions. Packed with informative data and charts, the paper, "Foreign Petroleum Refining," by C. J. Bauer, was followed closely. Bauer, head of the foreign petroleum-economics section, department of coordination and economics, Standard Oil Co. (N.J.), in speaking of the short-term outlook for demand over the next 5 years, said it is expected that the foreign areas will increase their use of petroleum at a fairly rapid rate, not only in the light-product category, but also in the heavy category.

Furthermore, Bauer stated, "it is not unlikely that total foreign demand, outside of Russia, will be about 35 per cent higher in 1951 than it was in 1946. Maximum efficient rates of crude-oil production and maximum use of refining facilities is called for as never before in the history of the industry."

Bauer explained that "the full effect of the refining and pipe-line facilities in the foreign regions which are in advanced stages of planning, and in some instances under construction, will not be fully felt for at least 3 or 4 years. Thus, the United States will probably find a ready export market which will tax its producing and refining capacity in this period. But as increasing quantities of supplies from the Middle East and Far East move into the markets of the Eastern Hemisphere, United States and Caribbean exports to this area will tend to increase."

Petroleum-product requirements of foreign countries in the Western Hemisphere are growing at a rapid rate, he explained, adding that the United States will require the special types of low-gravity crudes produced in the Caribbean area to supplement this country's supplies.

Speaking of civilian demand in 1946—the first full year of peace—and remarkable recovery shown, Bauer said 1946 oil demand reached 2,800,000,000 bbl., or 7,800,000 bbl. daily. Figures in the accompanying table show world and per capita demand statistics for 1946 as compared with 1941 for the Western Hemisphere and 1938 for the Eastern Hemisphere. (While many of the figures for foreign regions are partly estimated for all periods, those for 1946 are based on data more incomplete than in prewar years, Bauer explained).

Refinery Runs Abroad

In foreign countries of the Western Hemisphere, indications are that 1947 refinery crude runs will be very close to maximum efficient capacities, Bauer stated. Current refining capacity in these countries is estimated at slightly below 1,400,000 bbl. daily. However, he said, about 100,000 bbl. daily capacity is located in areas where crude supplies are inadequate to permit full operation or local requirements are not able to absorb full production. Consequently, effective capacity to run crude may be estimated more closely at 1,300,000 bbl. daily.

As of January 1, this year, the existing refining capacity in the Eastern Hemisphere was estimated at 1,908,700 bbl. daily. This total, despite destruction suffered during the war, was about 58,000 bbl. daily higher than the 1,850,000 bbl. daily capacity existent at the beginning of 1939, he said.

The two projected Persian Gulf-Mediterranean crude-oil pipe lines "will have a combined initial capacity of 600,000 bbl. daily," Bauer told the meeting. The lines which Bauer referred to are the Trans-Arabian Pipe Line Co.'s 1,050-mile 30-31-in. line from Saudi Arabia to some yet undisclosed Mediterranean port and the Middle East Pipe Lines, Ltd.'s line from Kuwait and Iran to the Mediterranean.

Dr. J. C. Geniesse, divisional director of research, Atlantic Refining Co., speaking on "Viscosity Measurement—Past and Present," said improvement in viscosity measurements of lubricating oils has been carried to a point where findings of different laboratories now generally are within 2/10ths of 1 per cent of each other, with a maximum range of 1 per cent.

Leading a round-table discussion on the "Operation of a Wage-Incentive Plan in Petroleum Refining," William H. Brush, industrial engineer, Atlantic Refining Co., told N.P.A. members that his company's incentive plan—in existence for 27 years—has been notably successful financial-

WORLD PETROLEUM DEMAND—1946 AND PREWAR

(In barrels of 42 gal. each)

	Year 1946	Last pre-war year 1941	Amount inc. (dec.)	per cent inc. (dec.)	1946 per cent of world	1946 per capita consumption
United States	4,906,700	4,070,600	836,100	20.53	63.13	13.60
Canada	221,500	174,300	47,200	27.08	2.85	7.03
Mexico	120,900	80,100	40,800	59.94	1.55	1.74
Other Latin American	467,000	354,100	112,900	31.88	6.01	1.73
Others	7,800	8,600	(800)	(9.30)	.10	7.38
Western Hemisphere exc. U. S.	817,200	617,100	200,100	32.43	10.51	2.26
Total Western Hemisphere	5,723,900	4,687,700	1,036,200	22.10	73.64	7.81
		1938				
Europe exc. Russia	808,300	930,900	(122,600)	(13.17)	10.40	.74
Africa	160,000	127,600	32,400	25.39	2.06	.42
Near and Middle East	145,000	71,500	73,500	102.80	1.87	1.19)
Far east and Oceania	420,700	336,800	83,900	24.91	5.41	.14) .18
Eastern Hemisphere exc. Russia	1,534,000	1,466,800	67,200	4.58	19.74	.34
Russia	514,700	562,300	(47,600)	(8.47)	6.62	.95
Total Eastern Hemisphere	2,048,700	2,029,100	19,600	.97	26.36	.40
Total foreign	2,865,900	*2,528,000	*337,900	*13.37	36.87	.52
Total world	7,772,600	6,598,600	1,174,000	17.79	100.00	1.32

*This is not an addition of the 1941 and 1938 demand data. It is an estimate of the total indicated demand. Because of the war, information for the year 1941 is lacking for most of the countries of the Eastern Hemisphere.

ly and has improved employe morale. Brush said that there has been an $8 to $10 actual return for every $1 spent for the administrative cost of the plan.

Speaking as a member of a discussion panel, "The Outlook in Labor Relations," J. W. Rees, personnel director of Pure Oil Co., predicted that the main issues between companies and labor unions, in the years immediately ahead, will not be wages as much as power. Rees based this prediction upon a survey he made among several oil companies, and explained that many of the union demands and desires spring from a hope "for greater participation in policy determination and for more power in the management of our companies."

Short-Term Steel Outlook

Thomas G. Patton, general counsel of Republic Steel Corp., said that the short-term outlook for adequate steel production was of grave concern but that the long-term picture was good. If a coal strike is not averted this summer, steel's production will suffer appreciably. Within the next 10 to 20 years, Patton predicted the question of who is to manage steel companies—the unions or the owners—will become a real issue. Currently, he said, companies are having seniority trouble with the unions over university-trained engineers and other specialists who often first must gain practical experience. Under some conditions now existing, it would take such a man 99 years to become a supervisor—and often the companies have their eyes set on such a man to be an executive in 10 or 15 years, he said.

Among the resolutions adopted at the meeting were those calling for the following action by Congress: a tax on reclaimed oil; lifting of the lubricating-oil tax; taxation for cooperatives; and approval of funds for the Oil and Gas Division on the basis of the industry's need for the agency.

NPC to Study Over-all Supply Situation

WASHINGTON.—An immediate study of the supply of crude oil and petroleum products, and shortages of steel and equipment needed for expansion was approved by the National Petroleum Council at its quarterly meeting here Tuesday.

The council specifically approved:

1. Creation of a committee to report on the current production of crude oil, distillates, and other petroleum products and the amount available consistent with the principle of of maximum efficient recovery.

2. A transportation coordinating committee to work with other council committees on this subject for the purpose of reporting the over-all facilities available for transportation of crude oil and petroleum products.

3. A committee to report on the refining capacity in continental United States, including new facilities under construction or announced for early construction.

4. Reactivation of the materials committee to report on existing shortages of casing, line pipe, compressors, refinery equipment, and other oil-industry equipment and supplies.

5. A committee to report on the requirements of the armed services and civil government agencies for petroleum products, and to make recommendations not involving programs or allocations.

These actions were taken at the request of several members of the council and of the Oil and Gas Division because of current difficulties of meeting the high rate of Government and civilian demands for petroleum products.

Equipment Suppliers Will Meet in San Francisco

A program of activities for the coming year will be planned by members of the Petroleum Equipment Suppliers Association at the association's annual meeting, to be held in the Mark Hopkins Hotel, San Francisco, May 4-7, according to Hugh H. Glen, Emsco Derrick & Equipment Co., president of the association.

H. H. GLEN

Nearly 300 members are expected to attend the 4-day program. Annual reports will be heard and new directors elected in the annual business session, scheduled for the morning of the closing day of the meeting.

The program follows:

SUNDAY, MAY 4

All day—Registration.
2. p.m.—Meeting of special committee.

MONDAY, MAY 5

10 a.m.—Open forum: Sales accounting Panel leading the discussion will consist of R. M. Morrison, general purchasing agent, The Texas Co., and chairman of the oil-company buyers group of the association; and R. A. Schell, R. D. Hilborn, John H. Lollar, Jr., and A. B. Ripley, all members of the association's sales-accounting committee.
12:15 p.m.—Directors' luncheon.
3 p.m.—Open forum. "Labor Relations," Frank Rhem, vice president and director of labor relations, Shell Oil Co., Inc.

TUESDAY, MAY 6

10 a.m.—General membership meeting. "Public Relations on the Part of Trade Associations," Don Gilman, vice president, Western Oil and Gas Association; "The Frequency of Publication of the Composite Catalog," Ray Dudley, president, Gulf Publishing Co.

WEDNESDAY, MAY 7

10 a.m.—General membership meeting. Election of new directors, followed by business reports.

this week

HEARINGS— Industry's representatives present their arguments to the House interstate and foreign commerce committee in behalf of the Rizley-Carson-Davis bill limiting power of FPC. . . . Committee postpones further consideration until early next month with much of the opposition yet to be heard. . . . Committee appears to agree on production and gathering restrictions but some members doubt if FPC should be denied control over price of gas produced by a transmission company itself. . . . ¶Senate committee schedules hearing on the companion Moore-Ferguson bill to open April 29. . . .

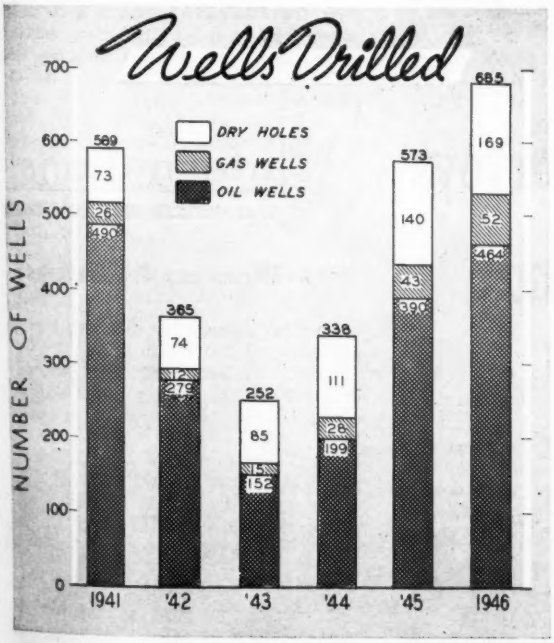
NATURAL GAS— Lone Star Gas management tells stockholders more than $9,500,000 will be spent for additions to its properties. . . . ¶United Gas asks FPC approval of construction of 1,500 miles of transmission lines in five southeastern states estimated to cost $57,000,000. . . . ¶Austin Field Pipe Line Co. submits FPC application to build 150-mile gas pipe line from Austin storage fields to Detroit. . . .

INTERNATIONAL— Gulf reveals expansion program now under way in Kuwait is to double production this year and quadruple output by the end of 1948. . . . ¶Socony-Vacuum modifies plans for 12-in. crude line in eastern Venezuela to provide for extension to Puerto la Cruz. . . . ¶C. J. Bauer, Jersey Standard foreign petroleum-economics expert, tells semiannual NPA meeting that 1946 world demand reached 2,800,000,000 bbl. or 7,800,000 bbl. daily. . . . Says maximum production and refinery runs is called for "as never before in the history of the industry."

APPROPRIATIONS— House appropriations committee cuts funds for Oil and Gas Division from $463,000 to $124,000. . . . Declares division has not been legally authorized to carry on any work other than Connally Act enforcement and suggests that division charge fees from the industry for its services. . . . The committee's general 47 per cent slash in Interior Department appropriations included $5,000,000 reduction for the Bureau of Mines and a cut for the Geological Survey from $18,000,000 to $9,113,230. . . .

REFINING— Humble reports total of $6,500,000 will be spent on lube plant now under construction at Baytown. . . . Annual report lists $11,000,000 expenditure in 1946 for new facilities. . . . ¶Gulf discloses in annual report that three 20,000-bbl. stills are now being built at Port Arthur. . . . Also building are a 32,000-bbl. polyform unit and a desulfurization pilot plant. . . .

EXPLORATION— Standard of California test in Oxnard Plain area, Ventura County, flows 243 bbl. 44°-gravity oil from 8,428-73 and 8,632-60 ft. . . . May open first major California strike in 5 years. . . . ¶Gulf has shallow sand discovery in North Vidor field, Orange County, Texas, flowing high-gravity oil through perforations at 6,932-34 ft. . . . Gulf's Ellenburger lime discovery in Crane County recovers 238 bbl. on drill-stem test at 10,799-10,850 ft. . . .



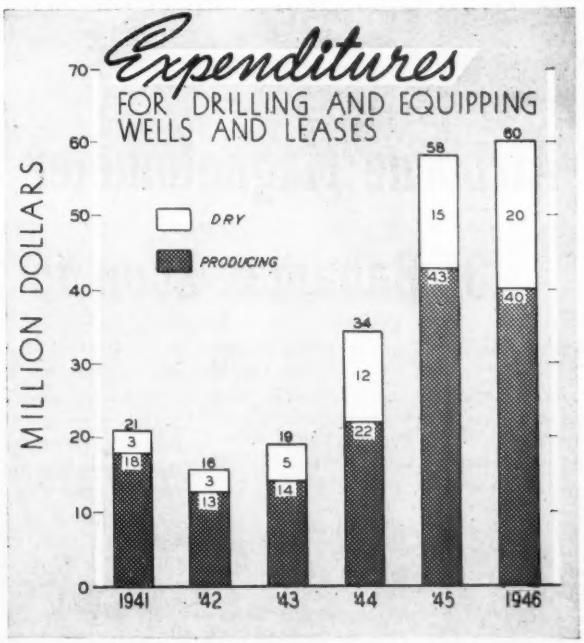
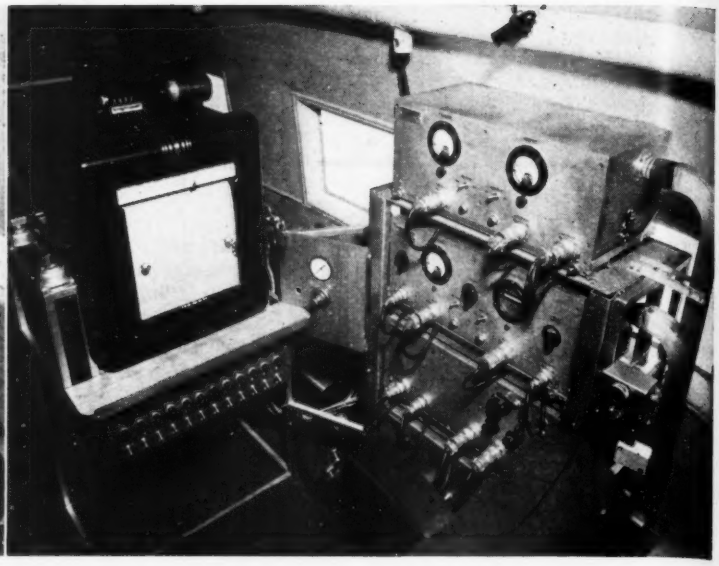
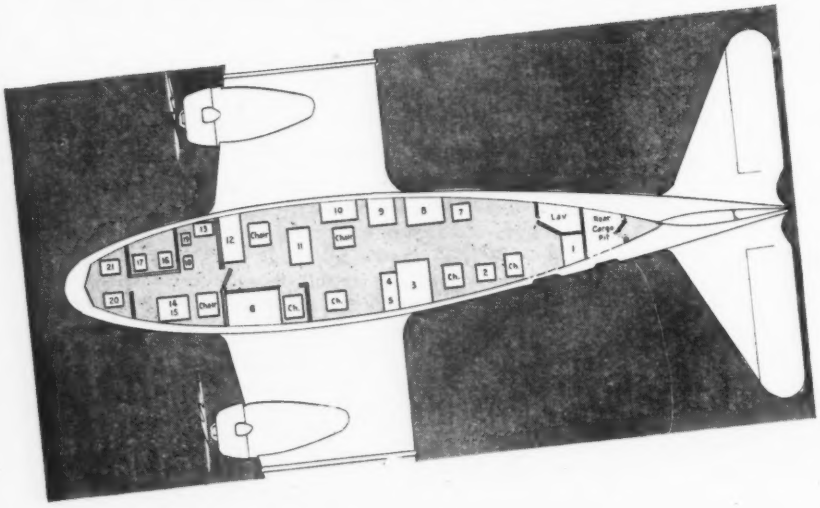


Chart from 1946 annual report of Humble Oil & Refining Co. showing increased costs of finding and producing crude oil. See editorial comment on page 87





General view from rear of plane is seen at left, above. The crew of six includes pilot, copilot, magnetometer operator, Shoran operator, flight director, and radio man. The view at right above shows magnetometer electronic panels, and recorder on which magnetometer data are presented. At left is a diagram showing equipment installation for magnetometer survey. (1) Galley, (2) Sonne camera, (3) Flight director's table, (4) Shoran position recorder, (5) Radio altimeter, (6) Shoran receiver, (7) Magnetometer detector pulley, (8) Plotting table, (9) Temperature-controlled battery box, (10) Rack for magnetometer control instruments, (11) Magnetometer data recorder, (12) Two radio receivers, (13) Radio transmitter, (14) Shoran transmitter, (15) Instrument landing equipment, (16) Pilot's low-frequency radio transmitters and receivers, (17) Pilot's high-frequency ditto, (18) Intercom amplifier, (19) Marker beacon receiver, (20) Pilot, (21) Copilot

Airborne Magnetometer Surveys Of Bahamas Soon to Start

International

by Warren W. Burns

WITH an aerial oil-exploration program which conceivably could open up areas of investigation which have heretofore been considered inaccessible, Aero Service Corp. shortly will commence a 50,000 to 80,000-sq. mile airborne-magnetometer survey of the entire Bahamas area.

The survey, estimated to cost approximately $650,000, will be carried out by the following companies: Anglo-Bahamian Petroleum Co., Ltd. (Anglo-Iranian Oil Co., Ltd.); Bahamas Exploration Co., Ltd. (Gulf Oil Corp.); Bahamas Oil Co., Ltd. (Superior Oil Co.); Shell Co. of Bahamas, Ltd. (Royal Dutch-Shell); and Standard Oil Co. (Bahamas), Ltd., an affiliate of Standard Oil Co. (N. J.).

Equipped with a magnetometer which was developed by Gulf Research & Development Co., along with the necessary instruments for controlling the flight, a DC-3 left for Nassau April 19. This survey will involve the most extensive use of continuously radio-controlled high-precision flight paths.

Most of the five companies and their associates are actively engaged at present with gravitimeter work in the Bahamas area. The results of the magnetic survey may easily have considerable effect on the exploration planning of the oil industry.

About 50 people will be actively engaged in the survey. This will include the plane crew, the crews of three boats—which will operate Shoran equipment — to determine position, and a ground crew of technicians and draftsmen to reduce and check the data and to maintain the electronic devices necessary for the work.

Officials of Aero Service explained last week that the uncertainty of position, as determined by the aerial magnetometer, does not exceed 200 ft. and usually is less. Magnetometer surveys must be conducted from

planes that are in complete control at all times with reference to their altitude and flight course. When ground areas are surveyed, this control is exercised by means of aerial photography.

As the vast stretches of water encountered in the Bahamas survey will offer few recognizable datum points, it will be necessary to locate and control the plane by triangulation with the aid of Shoran, a position control device developed by Radio Corp. of America for the Army Air Forces and extensively used during the war.

Shoran equipment will be used at Nassau, in addition to which three boats will be similarly equipped and operated by Overseas Navigation, Inc. The shore station and boats will be used as datum points from which the position control will be based. When the operation is in progress, these boats will be anchored fast to known positions.

The job of making a magnetometer survey at 2-mile intervals of the vast Bahamas area will require at least 6 to 8 months with continuous operation of complex electronic signaling and recording devices. Invisible magnetic storms, resulting from sun spots, as well as more obvious wind storms and hurricanes of the region, will be among the natural forces which must be reckoned with.

When the survey is finished, the five participating companies will have a map showing the magnetic variations recorded by this aerial survey which then will be interpreted with a view of laying out further geophysical programs. One of the by-products of the survey will be relocating of all the Bahama Islands on a map.

Aero Service Corp. has already conducted a 30,000-sq.-mile survey in Alaska with promising results. In these surveys, the plane can fly in cloudy weather and as a matter of fact much of the projected Bahamas surveys probably will be conducted at night as the air is not as rough. The aerial surveys will be followed by gravitimeter work for a certainty, according to Homer Jensen, chief of the magnetometer division of Aero Service Corp.

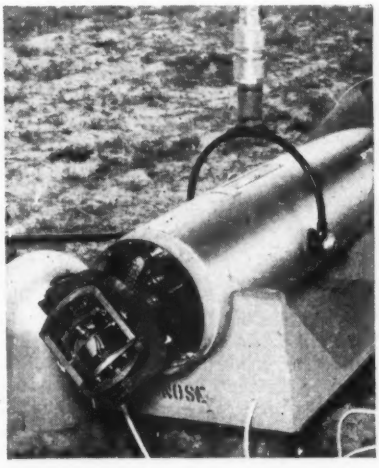
Chief Operational Problem

The chief operational problem of this survey will be to guide the plane within 200 ft. for a few thousand miles, a problem which is likely to be most complex.

Operating under very favorable conditions, it is estimated that 2,000 sq. miles can be surveyed daily. However, considering the normal weather conditions in that area, 10,000 sq. miles a month will be considered excellent progress.

In conducting aerial magnetometer surveys, the plane must fly much lower than when aerial photographic work is being carried out.

Oil-company officials who were present at the April 15 demonstration of the aerial magnetometer in Philadelphia included: Norval Baker, chief geologist of Iraq Petroleum Co., Ltd.; J. E. Anderson, of Anglo-Iranian Oil Co., Ltd.; Eugene Jablonski, chief gegologist of Socony-Vacuum Oil Co., Inc.; Ralph Wyckoff, assistant manager of geophysics, Gulf Research & Development Co.; Bruno Winkler, chief geologist of Standard-Vacuum Oil Co.; Roland Mangel, assistant chief of aviation sales of R.C.A.; C. F. Lunghard and C. H. Guerin, Asiatic Petroleum Corp.; R. F. Weichert and D. C. Skeels, geophysicists, Standard Oil Co. (N.J.); T. V. Moore, producing coordinator of Standard Oil Development Co.; E. P. Felch, technical staff of Bell Telephone Laboratories; W. S. Olson, geologist for foreign operations, and A. J. Haworth, The Texas Co.; Hollis Hedberg, Gulf Oil Corp.; and Chan Ford, Terry Mason, and Richard Harris, Atlantic Refining Co. Thomas Hassett, head of Aero Service Corp.'s compilation section, assisted Jensen in the demonstrations.



Right: The "bird" and cradle in which it is held during flight. Extreme right: The bird with head removed. It is made of fiber glass. Below: Air-sea rescue boat, one of three to be used in the survey

New officers of the eastern district, American Petroleum Institute Division of Production, include this group: H. R. Brankstone, Gulf Oil Corp., Pittsburgh, district secretary-treasurer; W. L. McCloy, Jr., Standard Oil Co. (Ohio), Cleveland, vice chairman; J. V. Goodman, Equitable Gas Co., Pittsburgh, district chairman; E. H. Tollefson, Hope Natural Gas Co., Clarksburg, W. Va., vice chairman; and R. B. Anderson, Columbian Carbon Co., Charleston, W. Va., retiring district chairman now on the advisory committee

Vast Eastern Gas Market Outlined At Pittsburgh A.P.I. Meeting

by Dahl M. Duff

PITTSBURGH.—Natural gas will in all probability find its first major use in the eastern fuel market as a replacement of oil used for enrichment by the manufactured-gas industry, James E. Pew, manager of the natural-gas department, Sun Oil Co., told the eastern district meeting of the American Petroleum Institute's Division of Production here April 18.

Pew estimated 131,000,000,000 cu. ft. of natural gas annually would be required in the East for this use alone if the resultant mixed gas should be between 700 and 750 B.t.u. which is necessary to avoid consumer appliance adjustments. This first likely use of natural gas would displace 16,250,000 bbl. of oil annually.

The Sun official presented a detailed analysis of principal prospective uses for natural gas in New England and the Middle Atlantic states. His paper attracted considerable interest because of the stimulus given gas exploration by the present heavy demand and also because of current eastern gas-transmission projects.

To replace completely all fuels in the eastern area, pipe lines having more than 31 times the combined capacity of the Big Inch lines would be needed, he said. On a B.t.u. basis, the thickly populated East could use nearly 5 trillion cubic feet of natural gas annually—more than twice the total 1945 sales of all natural-gas utility companies.

"However," Pew said, "we must be realistic. For many and sundry reasons, natural gas cannot replace all other fuels in this area. A large part of the market would be inaccessible to the pipe lines. . . ." Residential and commercial consumers of fuel in the area, he said, represent a potential market of 1,945 billion cubic feet of natural gas, but the encroachment on this market is most likely to be by the manufactured-gas companies that are selling a mixed gas of an average of 725 B.t.u. and who will have the capacity and necessary distribution systems already installed.

The trend curve of rapid expansion in the use of natural gas, combined with a highly favorable outlook for future supplies, Pew told the meeting, makes it apparent that natural gas "not only can, but will, replace other fuels if given access to the market." Four barriers, he said, prevent the natural-gas industry from realizing the potential of this vast market. These are (1) lack of pipe-line capacity into the area; (2) the attitude of the Federal Power Commission; (3) misconceptions over the adequacy of our natural-gas reserves, and (4) the "short-sighted" philosphy of some political leaders in the Southwest who believe their own areas will be enriched if the export of gas is blocked.

Some Imports Needed, Hardey Says

The eastern district meeting opened April 17 in the William Penn Hotel. First speaker at the lead-off general session was B. A. Hardey, Shreveport, La., president of the Independent Petroleum Association of America, who warned against "suggestions of a strange doctrine . . . not for a domestic bureaucratic control, repugnant as that would be, but for a control by an international bureaucracy."

In his discussion of a national oil policy and the domestic petroleum industry, Hardey said producers realize it is necessary to augment their production with imports, but, he continued, imports must be in such quantity as to allow domestic industry to remain healthy and solvent. "I have no fears of imports so long as demand stays up as it is today," he asserted, "but public interest will suffer if a policy to control these imports is not adopted."

The second general-session speaker was Franklyn Waltman, Sun Oil Co., chairman of the A.P.I. public-relations operating committee. Waltman asked for "grass-roots support" of the A.P.I. program, declaring that "if we are to preserve the fundamental rights of local self-government, preserve a competitive enterprise system in which free people shall have opportunity to exercise their initiative, then as far as oil is concerned, we must move as a united industry in presenting our case to the public."

Rotary Drilling in Ohio

The pioneering use of rotary equipment in Ohio was described by Noah Andrews, general manager of Union

Drilling & Producing Co., and president of Union Rotary Corp., Mt. Pleasant, Mich. To operate profitably in the Canton area with rotary equipment, it will be necessary, Andrews said, to get $4.25 per foot drilled, and "until such time as this price is forthcoming, the cable-tool contractors need have no concern about rotaries in Ohio."

Average bit cost for a 4,700-ft. rotary hole in Canton is $3,000; average time is 40 days, he said. Principal advantages are a saving of about $4,000 on casing and the benefjt of having a well on production 20 to 40 days sooner.

"It is evident that cable-tool drilling is somewhat cheaper than rotary-tool drilling," he continued. "However, 20 to 40 days saved in drilling time would mean a great deal to a producer if he were offsetting a 5,000-bbl. oil well or a 50,000,000-cu. ft. gas well. It is also evident that in areas where the Drift is very thick, a rotary unit would drill 500 to 700 ft. of this formation in 8 to 12 hours, while a cable-tool unit would require 10 to 20 days to drive pipe through the same formation."

Another technical-session discussion on Ohio operations was that given by James F. Swain, Huntley & Huntley, Pittsburgh, on "Practical Aspects of Drilling the Clinton Sands of Ohio." Swain emphasized that accumulation of oil and natural gas in the Clinton has long been known to be controlled by sand conditions involving problems of sedimentary geology and that structural effect on accumulation is rare and questionable. Recoverable Clinton production per acre, he said, will not stand the cost of expensive innovations in drilling and production, although some of the special services and equipment developed in the Mid-Continent may be used with modifications.

Bradford Water-Flood Data

Technical papers on secondary-recovery developments were a significant part of the program for many eastern-area engineers and operators. Factual operating data on four Bradford water floods were presented by Harry M. Ryder, Washington, a long-time Bradford operator and engineer, in a discussion of the effect of water-pressure increases on water-flood production. Substantial increases in ultimate production were noted in all cases. Ryder stressed it is desirable to apply highest pressures as soon as possible.

Of interest particularly to secondary-recovery engineers was "Recent Advances in Selective Exclusion of Water in Input Wells," by Don Martin, Hercules Powder Co., Wilmington, Del.; Kurt H. Andresen, South Penn Oil Co., Bradford; and F. W. Ellenburger, Kendall Refining Co., Bradford. This paper was published in abridged form in The Oil and Gas Journal, April 19, page 106.

A documented appeal for an increase in prices for natural-gas production and a raise in rates in the Appalachian area was made by Alden W. Foster, Pittsburgh petroleum engineer, when he spoke on "Some Eccnomic Factors Affecting the Natural-Gas Supply in the Appalachian Region." Another paper on natural gas in addition to those by Pew and Foster was "Design of Long-Distance Natural-Gas Transmission Lines," by R. G. Strong and T. H. Beals, Natural Gas Pipeline Co. of America, Chicago. This discussion was published in The Oil and Gas Journal, April 19, page 88.

Underground Coal Gasification

Tentative results of the recent Bureau of Mines-Alabama Power Co. experiment in underground gasification of coal at Gorgas, Ala., were reviewed by L. D. Schmidt, of the Synthesis Gas-Production Laboratory, Bureau of Mines, Morgantown, Va. One reason for the work, he said, is that it promises to furnish low-cost gas for liquid-fuel production. The Gorgas experiment, in which a 2,000-ton bed was isolated and fired by incendiary bombs, indicates there are many unsolved technical problems.

Besides the 10 technical and two general papers, other activities at the meeting included the luncheon meeting of the district's active secondary-recovery committee and a special luncheon given officers of the district by Jake L. Hamon, Dallas, A.P.I. vice president for production. Registration for the meeting was well over 400.

At the business meeting, J. V. Goodman, Equitable Gas Co., Pittsburgh, was elected district chairman succeeding R. B. Anderson, Columbian Carbon Co., Charleston, W. Va. Other new officers are: Vice chairmen—K. C. Cottingham, Ohio Fuel Gas Co., Columbus; Paul J. Kesel, Carnegie Natural Gas Co., Pittsburgh, W. L. McCloy, Jr., Standard Oil Co. (Ohio), Cleveland; H. F. Sackett, Evansville, Ind., producer; J. E. Schaefer, East Ohio Gas Co., Cleveland; W. M. Schulz, Cities Service Oil Co., Mount Pleasant, Mich.; J. F. Swain, Huntley & Huntley, Pittsburgh; E. H. Tollefson, Hope Natural Gas Co., Clarksburg, W. Va.; S. M. Vockel, Waverly Oil Works Co., Pittsburgh; and secretary-treasurer, H. R. Brankstone, Gulf Oil Corp., Pittsburgh.

Among the group handling arrangements for the Pittsburgh meeting of the eastern district, A.P.I. Production Division, were E. J. Straub, Equitable Gas Co., entertainment; George Neilson, Equitable Gas Co., publicity; and F. C. Hauber, Peoples Gas Co., room arrangements. All are of Pittsburgh

O'Mahoney Will Address Directors of I.P.A.A.

An address by Sen. J. C. O'Mahoney, "Elements of a Sound National Oil and Gas Policy," will highlight the midyear directors meeting of the Independent Petroleum Association of America, to be held in Jackson, Miss., May 8-9.

All producing areas of the nation will be represented at the meeting, which will also feature reports of committees of the association engaged in making studies of particular industry problems.

The first session will be devoted to exploration, development, and geology of the southeastern area. Later sessions will consider such problems as the proposed 18-nation trade agreements, tideland ownership, and the effect of imported oil on the domestic industry.

The question of imports of foreign oil will be discussed in a forum before a panel consisting of L. F. McCollum, coordinator of production, Standard Oil Co. (N.J.); Howard Page, economist with the same company; H. B. Fell, executive vice president, I.P.A.A.; and Minor S. Jameson, Jr., I.P.A.A. economist.

The opening session will include talks by Urban B. Hughes, consulting geologist, Laurel, Miss., on geology of Mississippi; Clyde Alexander, Dixie Geological Service, Jackson, on oil development in southeastern states; Alec Crowell, vice president, Texas Eastern Transmission Corp., on present and potential reserves of Mississippi; and E. D. Kenna, executive vice president, Mississippi division, Mid-Continent Oil and Gas Association, on the economic value of oil to Mississippi.

Field Allowables, Producing Days Increased by Texas Commission

THE Texas Railroad Commission again boosted Texas' allowable production, for May, by increasing the number of producing days and some field allowables. The new total allowable was estimated at 2,392,428 bbl. daily, compared with April's total of 2,186,000 bbl.

Estimated under-production of 6½ per cent would reduce May production to 2,236,920 bbl. daily, but it still would be 116,920 bbl. over the Bureau of Mines demand estimate of 2,120,000 bbl. daily. Total nominations for May were up 53,040 bbl., to a total of 2,522,873 bbl. daily.

West Texas Benefits

Largest increase in production will occur in West Texas, where producing days will be 20 in May, compared with 18 in April. In addition, allowables for Slaughter and Wasson fields were increased to supply more oil for Stanolind Pipe Line Co. to move north through Oklahoma. Wasson, which is exempt from shutdowns, had its allowables in May raised by 5,746 bbl. daily. Slaughter, subject to the 20-day pattern, was increased approximately 5,442 bbl. daily. Total West Texas increase in May is estimated at 47,168 bbl. daily.

East Texas producing days were increased one over the current rate to 23 in May, which will add approximately 5,000 bbl. daily to the total production. H. P. Nichols, Tyler, executive vice president, East Texas Oil Association, and Paul McDermott, Sinclair Prairie Oil Co., Fort Worth, had asked the commission for 23 producing days in East Texas. Chairman E. O. Thompson said that with increased water injection, and the application of proper secondary recovery methods, the bottom-hole pressure had increased 18.89 lb. during the 26-month period from January 1, 1945 through February 1947, while 270,305,682 bbl. of oil were being produced.

Tank Cars Available

Humble Oil & Refining Co. asked the commission for an additional 15,000 bbl. daily from West Texas, to be moved by tank car. Nelson Jones, representing Humble, said that tank cars are available to move this amount in May. He said that pipe-line facilities are expected to be enlarged by June, which would enable the movement of another 15,000-bbl. increase at that time. Jones said that if tank cars and coastal terminals are available, as well as pipe-line facilities to Midland, Humble could handle an additional 35,000 bbl. in June, or a total of 50,000 bbl. over the present allowable.

The next statewide hearing will be conducted May 14 in Corpus Christi. Chairman Thompson said a 90-day order will be considered at that time.

Record Capital Outlay Noted in Jersey Report

ALTHOUGH capital expenditures of Standard Oil Co. (N.J.) and its affiliates increased more than 50 per cent in 1946, even greater expenditures are foreseen by the company this year in order to meet the continued unprecedented demand for petroleum products.

The company's annual report this week attributed the record high demand to heavy motor travel and transport, high industrial production, increasing use of oil in agriculture and home heating conversions from coal to oil, reconstruction needs, and continued deployment of United States military forces. Capital expenditures in 1946 reached $278,789,000.

The need for capital expenditure was particularly great, it was explained, because special facilities installed to meet war needs failed to raise over-all crude-running capacity of the industry to any appreciable extent, and it was impossible to keep pace even with normal replacement of equipment during the war. "Consequently," the Jersey management said, "the present backlog of construction work is especially large. Moreover, the world-wide expansion of facilities to meet rising demand and the need for new equipment to take advantage of technological advances require major capital outlay."

In 1946, Jersey's gross world-wide crude production averaged 1,091,000 bbl. daily, an increase of 9.6 per cent. Domestic affiliates' production of 429,000 bbl. daily was up 1.4 per cent. Foreign output gained 15.7 per cent over 1945. Crude production, the report said, is approaching the maximum level with present production facilities and is taxing gathering and transportation facilities almost to the limit.

In the foreign refining field, the report noted further reconstruction work was done on war-damaged refineries. The Fawley, England, refinery was back to capacity operation, and the Port Jerome refinery in France was at about half capacity at the close of the year. The Ploesti, Romania, refinery increased its output but did not reach prewar level.

As for research, Jersey reported studies have been made of the use of high-octane fuels in automobiles of very high compression ratio. "These fuels can increase power and miles per gallon materially when burned in engines designed to utilize them," it continued. "Commercial manufacture of the fuels is now possible because of new processes and equipment largely developed during the war but additional research will be needed to lower costs and assure the quantities that will be required when the improved engines are available." The company said progress has been "encouraging" in its pilot-plant work on the conversion of natural gas into liquid hydrocarbons, and said a large pilot plant for this process will be constructed in 1947.

Stripper-Well Group Ask More Conservation Laws

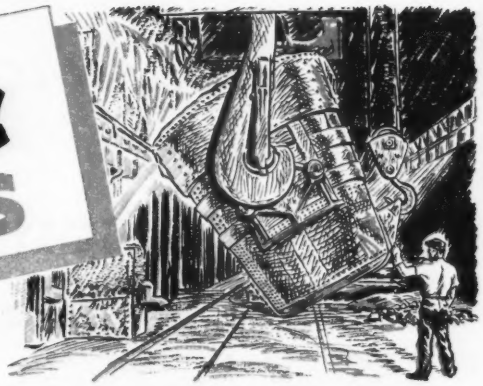
ST. LOUIS. — A resolution urging all oil-producing states without conservation laws to enact such legislation immediately and properly enforce it was adopted here last week in a joint meeting of stripper-well committees representing the Interstate Oil Compact Commission, the Independent Petroleum Association of America, and the National Stripper Well Association.

Such legislation, the resolution declared, would be the best means of solving the stripper-well problem. The group approved unanimously plans for a detailed survey of the stripper-well situation.

Following are the nine points under which information will be developed by the survey.

1. The stripper-well areas of the nation, the states where located, the pools in each state and the productive acreage of each, and the approximate number of stripper wells in each pool.
2. The reserves involved.
(a) The recoverable reserves with present known methods of primary and secondary means.
(b) The residual reserve.
(This information to be supported by all engineering data available.)
3. Statistics on abandoned wells.
4. Current production from stripper-well areas.
5. Relative production costs of primary, secondard, and stripper production.
6. Relationship and importance of the stripper-well industry to the community interest such as federal, state, and county tax revenues, employment, etc.
7. Quality of crude oil underlying the stripper-well reserves.
8. Analysis and coordination of above facts to ascertain importance on stripper-well reserves to national welfare.
9. Any other facts or figures which may prove helpful in the conservation of stripper-well production.

Youngstown to NORTH TEXAS

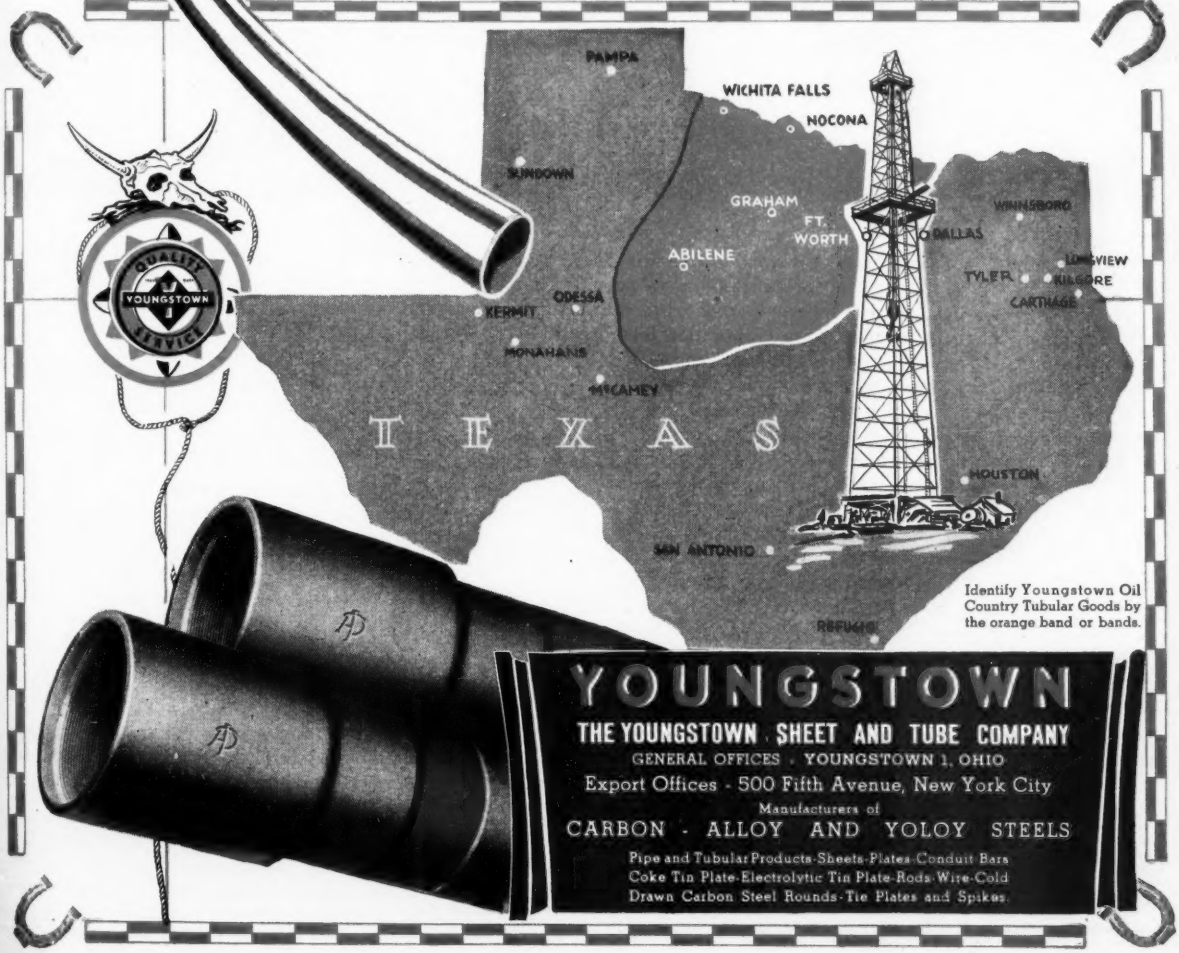


FOR over 40 years North Texas has paid rich oil rewards for effort. Its pools have been small and scattered, but many and productive. Output of crude has climbed steadily through the years. New discoveries and extensions keep adding to its proven reserves.

In North Texas, wildcat success runs well above the state and national average, thereby stimulating both shallow and deep well drilling in recent years. Last year saw more completions here than in any other part of the state.

Since the first wide spread discoveries of oil back in 1902, North Texas has used many millions of feet of Youngstown drill pipe, casing, tubing and line pipe. The assured future of the area indicates that the industry will call for many more millions of feet. For the oil men of North Texas, like those of every other petroleum area in the world, have learned through experience, that the orange bands on pipe are the mark of uniformly high quality and dependability.

Locations circled indicate Continental Supply Company stores.



Identify Youngstown Oil Country Tubular Goods by the orange band or bands.

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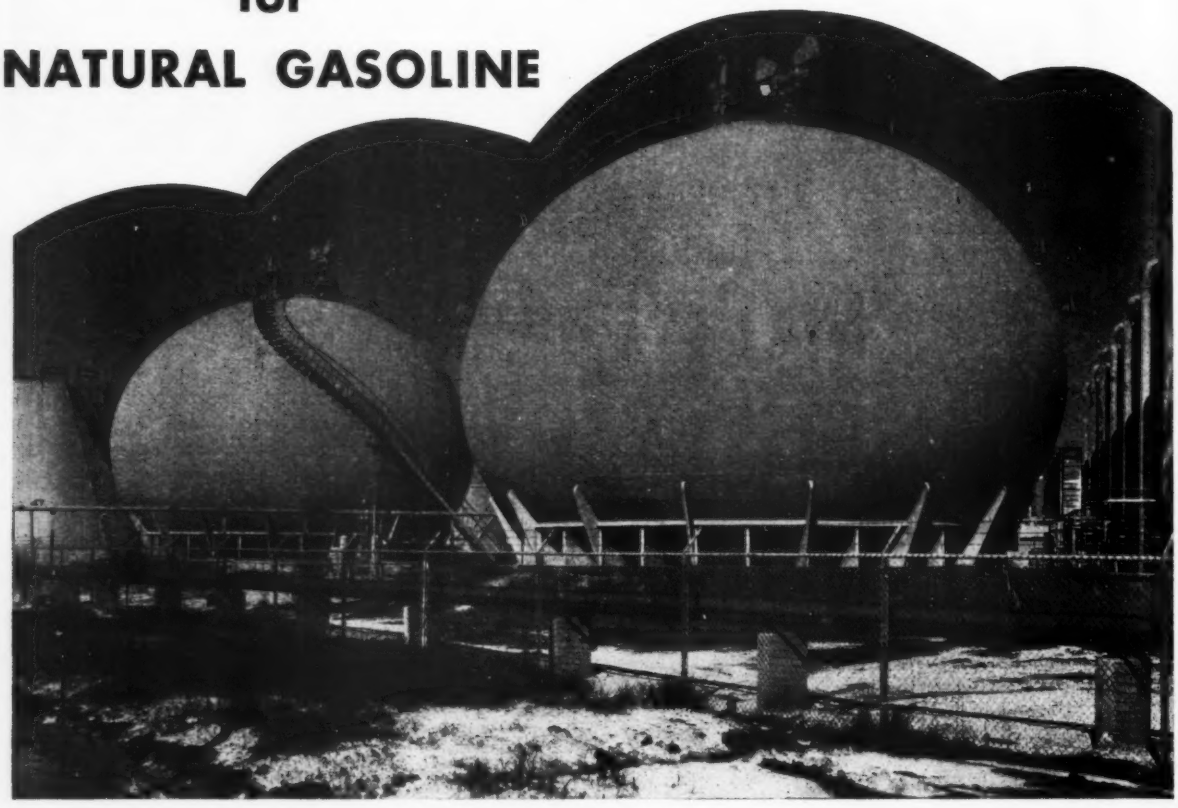
Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Pipe and Tubular Products-Sheets-Plates-Conduit Bars
Coke Tin Plate-Electrolytic Tin Plate-Rods-Wire-Cold
Drawn Carbon Steel Rounds-Tie Plates and Spikes.

THE "*Natural*" STORAGE TANK . . . for NATURAL GASOLINE



YES, the "natural" place to store hydrocarbons ranging in volatility from motor gasoline to natural gasoline—is in a Hortonspheroid—*that is,* if you want to protect them from excessive evaporation losses.

Hortonspheroids are "tailor-made" for storing natural gasoline. The grades most widely used in the production of blended motor fuels have vapor pressures ranging from 14 to 26 lbs. per sq. in. absolute at 100° F. It is not practical to store products of this class in ordinary storage tanks because of their tendency to vaporize rapidly or boil under atmospheric pressure at normal storage temperatures. By making use of the simple principle of pressure storage, as provided by the Hortonspheroid, you can handle these products with a minimum amount of loss through evaporation. Hortonspheroids also reduce the danger of fire during the storage period. They give years of trouble-free service at no operating cost aside from general maintenance. For years the petroleum industry has used the Hortonspheroid for efficient and economical storage of moderately volatile products.

Plain type Hortonspheroids are built in capacities of 2,500 to 40,000 bbls. for pressures from 2½ to 35 lbs. per sq. in. Noded type Hortonspheroids are built in capacities of 20,000 bbls. to 120,000 bbls. for pressures from 2½ to 20 lbs. per sq. in.

Write our nearest office for quotations on Hortonspheroids. Also ask for Bulletin E describing this pressure storage tank in detail.

The two Hortonspheroids shown above are located at the Republic Oil Refining Company refinery in Texas City, Tex. They hold 10,000 bbls. each and are used to store volatile products at 15 lbs. per sq. in. pressure.

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New York, 6.....3347-165 Broadway Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Los Angeles, 14.....1423 Wm. Fox Bldg.
Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1536 North 50th St.
Tulsa, 3.....1606 Hunt Bldg.
Houston, 1.....5619 Clinton Dr.
Philadelphia, 3.....1615-1700 Walnut Street Bldg.
Havana.....402 Abreu Bldg.
San Francisco, 11.....1254-22 Battery Street Bldg.
Detroit, 26.....1514 Lafayette Bldg.

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Chicago Bridge & Iron Company, Limited, Apartado 1348, Caracas, Venezuela
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Constructions Metalliques de Provence, Arles-sur-Rhone, France
Leopoldo Sol & Cia., Reconquista 558, Buenos Aires, Argentina
Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland

Committee Recommends Slash in Funds Virtually Eliminating OGD

WASHINGTON. — Virtual elimination of the Oil and Gas Division has been decreed by the House appropriations committee in reporting out the Interior Department appropriation bill for the fiscal year beginning July 1.

The bill carries only $124,000 for OGD for the entire year, all of it earmarked for enforcement of the Connally Hot Oil Act. The Budget Bureau had recommended $463,000 for OGD, including $218,000 for the Connally Act and the balance for the other functions outlined in the executive order creating the division.

The committee justified the cut on the ground that OGD has not been authorized by legislation to do anything beyond Connally Act enforcement.

In discussing the Oil and Gas Division in its report the committee said:

"The committee considered an estimate of $463,900 for this activity and has included $124,000 under current year requirements and $339,900 less than the budget estimate. Of this reduction $245,000 is for work of the Oil and Gas Division which justifies its request for appropriation on the ground that it will coordinate and unify the policies of the federal Government with respect to petroleum, and that the statistics and studies conducted by it will render service to the oil and gas industry. Its service to industry is to provide information which industry cannot get itself without violating the antitrust laws.

Industry Collections Proposed

"Basic legislation has not been enacted establishing an Oil and Gas Division empowered with these functions. The committee has therefore eliminated this work until Congress adopts basic legislation for the work. The committee hopes that collections can be made from the oil and gas industry in the same manner that the Bituminous Coal Commission required payments from the coal industry for services rendered it.

"The remainder of the estimate for this agency, amounting to $218,900, was requested for enforcement of the provisions of the so-called Connally Act. The committee has allowed a total of $124,000 for this purpose. The committee has recommended this reduction because it is advised that the production and transportation of hot oil have been reduced to a negligible amount. While it is the contention of the Interior Department that the principal violations now encountered involve the production of oil in excess of state allowables for certain wells and that emphasis should be centered on preventing such violations, the committee feels that this phase of the work should be regulated by the state. Incidentally, the committee is advised that this work is being performed with a high degree of efficiency by the Texas Railroad Commission.

Phillips Announces New Wholly Owned Subsidiary

Formation of a wholly owned subsidiary, Drilling Specialties Co., with headquarters in Bartlesville, Okla., was announced last week by Frank Phillips, chairman, and K. S. Adams, president, of Phillips Petroleum Co.

The company will handle Driscose, new drilling-mud additive, and will introduce other products, equipment, and services.

Officers of the new company are George R. Benz, president; C. C. Crawford and J. R. Pettigrove, vice presidents; B. F. Stradley, secretary-treasurer; P. J. Parker, assistant secretary-treasurer; T. V. Stevens, assistant treasurer, and R. E. Arnold, assistant secretary.

Industry Losses Heavy in Texas City Disaster

OIL and chemical industry executives, stunned by the devastation resulting from the series of explosions which wrecked the waterfront and portions of the industrial areas of Texas City, Tex., early this week, began counting losses of the disaster, which took the lives of an estimated 600 persons and ran property damage well over $100,000,000.

At the Monsanto Chemical Corp. plant, where 31 were counted dead in the first 24 hours, the final death toll was expected to exceed 100. The plant, built in 1942 by the Government at a cost of $18,800,000 and bought by Monsanto last year for $9,500,000, was devastated, but while workers searched the ruins, President William M. Rand announced plans to rebuild the entire plant, on its present site.

At Republic Oil Refining Co.'s 23,000-bbl. capacity refinery, 10 were listed as dead, including W. P. C. Voiles, plant superintendent, B. M. Stewart, director of industrial relations, and Fred I. Lutteman, process engineer. W. R. Holmsten, vice president and general manager, headed the list of 27 still missing. Fifteen others were injured. W. E. Huston, president, said Monday the company was "unable to state the extent of damage" and announced that Assistant Superintendent R. E. Feasel, uninjured, had been placed in charge. Included in the Republic dead were several young engineers acting as a fire-fighting crew aboard the French ship, Grandcamp, when the vessel exploded.

Seven operating and maintenance personnel, Pan American Refining Corp., were dead, and four missing. While the plant, 3 miles from the blast scene, was hardly damaged, heavy losses occurred at the waterfront, where explosions and fire damaged docks and loading lines and destroyed stored materials. President D. J. Smith said damage to shipping facilities probably can be repaired in a short time, and the company early this week was arranging to resume refining operations. No key personnel were casualties.

At the Sid Richardson Refining Co. plant, bought recently from American Liberty Oil Co., all personnel escaped death and injury. Five storage tanks, including three of 80,000-bbl. capacity, were destroyed, according to Guy Mosley, company official.

Two Carbide & Carbon Chemicals Corp. employes, A. H. Cannon, assistant superintendent of the company's South Charleston, W. Va., plant, and H. O. Youngman, machinist, were killed, and a third, Carl R. Ferris, was missing. H. M. Ross, plant superintendent, said the plant was closed down at 3:30 a.m. Tuesday as a precautionary measure but will be reopened as soon as conditions permit. He said the plant sustained "virtually no damage," although nine storage tanks in the dock area were destroyed.

Heavy damage was reported also at the 7,500-bbl. refinery of Stone Oil Co., located near the scene of the blast.

Much of the credit for fire fighting and rescue work from the time of the explosions went to industry-organized crews from the affected companies. About 300,000 lb. of foamite was moved to the area from Humble Oil & Refining Co.'s Baytown refinery, whose chief fire fighter was in charge of activities. Cementing trucks with large pumping capacity were sent to the scene by Halliburton Oil Well Cementing Co.

Humble's damage consisted of loss of tanks, crude oil, and docks estimated at $1,500,000. No company personnel were killed or injured.

WASHINGTON WATCHING

BY HENRY D. RALPH

Drastic Budget Action

WASHINGTON.—Funds for maintaining the Interior Department for the next fiscal year are cut 47 per cent below the request of the Budget Bureau in the appropriation bill just reported to the House.

Though the heaviest cuts were made in construction funds for reclamation and power, every activity of the department suffered severe reductions, including those pertaining to the oil and gas industries.

The appropriations committee allowed $156,538,513 for the whole department, or $138,881,907 below the budget and $101,362,173 below the current year's appropriation. However, it pointed out that this is $26,000,000 more than the department got in 1938 and said it has made only a beginning in reducing the department's spending to a sound postwar level. The committee eliminated funds for all activities not specifically authorized by law, advised the department to readjust its operations for a further reduction next year, and suggested that plans be developed to recover costs from private industry benefited by department services.

Bureau of Mines was given $10,983,875, a cut of $5,000,000 below the current year and $5,800,000 below budget requests. Funds for its synthetic-fuels program were cut from $5,000,000 to $3,000,000; for oil and gas investigations, including secondary-recovery studies, from $900,000 to $579,000; and for mineral economic studies and petroleum statistics from $1,233,000 to $555,000.

Geological survey, for which the budget asked $18,000,000, was given $9,113,230, with cuts in all its activities.

Bureau of Land Management was cut from $5,000,000 to $3,619,500, with virtually the entire cut in funds for mineral leasing and administration of the public domain.

The committee severely criticized the Geological Survey and Bureau of Mines for failing to reduce their operations to the prewar level and suggested that most of their activities should be done by private industry which receives the benefits.

New Tank-Car Injunction

A THIRD restraining order issued by the federal court here Monday further complicated disposal of the Government's surplus liquefied-petroleum-gas tank cars and put another obstacle in the plan of the Office of Defense Transportation to redistribute the 423 cars among L.P.G. shippers.

The latest action was obtained by Phillips Petroleum Co. which has been ordered by ODT to surrender to competitors all but 24 of the 189 cars it operates on lease from War Assets Administration. The injunction prevents ODT from enforcing its April 14 order on all Class 1 railroads to divert Phillips cars to other shippers whenever they appear on the rails. Earlier Phillips had obtained an injunction preventing WAA from cancelling its leases on the cars ODT had assigned to others. Still earlier, Martin H. Champion, Oklahoma City tank-line operator, had obtained a court order preventing WAA from selling these same cars according to the ODT allocation, since Champion claims veteran's-preference rights to purchase a majority of them.

While some other shippers would lose a few cars each under the ODT allocation, by far the largest block would be taken from Phillips. Phillips claims the ODT order is without legal basis since the Second War Powers Act expired March 31, that the ODT allocation plan was inspired by competitors having undue influence on ODT, and that the plan would not increase efficiency in L.P.G. distribution.

Industry Presents Case For Curbing FPC

WASHINGTON.—Arguments of the oil and gas industry for amendment of the Natural Gas Act were virtually completed last week before the House committee on interstate and foreign commerce, but further consideration of the subject was postponed until early May by pressure of other business before the committee.

Still to be heard are spokesmen for the Federal Power Commission, several witnesses for coal and railroad interests, and a summation and rebuttal for the oil and gas industry.

So many witnesses sought to speak in favor of the Rizley-Carson-Davis bill that they threatened to consume the entire week allotted to the hearings, and even though many of them simply submitted their statements for printing there was insufficient time to hear much of the opposition.

Every section of the bill was discussed at length but most emphasis was put on the provision to deny the Federal Power Commission any control over production and gathering of gas. This was supported by oil producers, gas producers, royalty owners, gas pipe lines, and state officials. Even a spokesman for coal interests endorsed it, and no witness to date has expressed opposition.

Following a thorough analysis of the entire bill by Rep. Ross Rizley of Oklahoma, introducer of the principal measure, a score of spokesmen for the industry discussed various aspects in detail to give the committee a complete picture of the problems posed by FPC regulation.

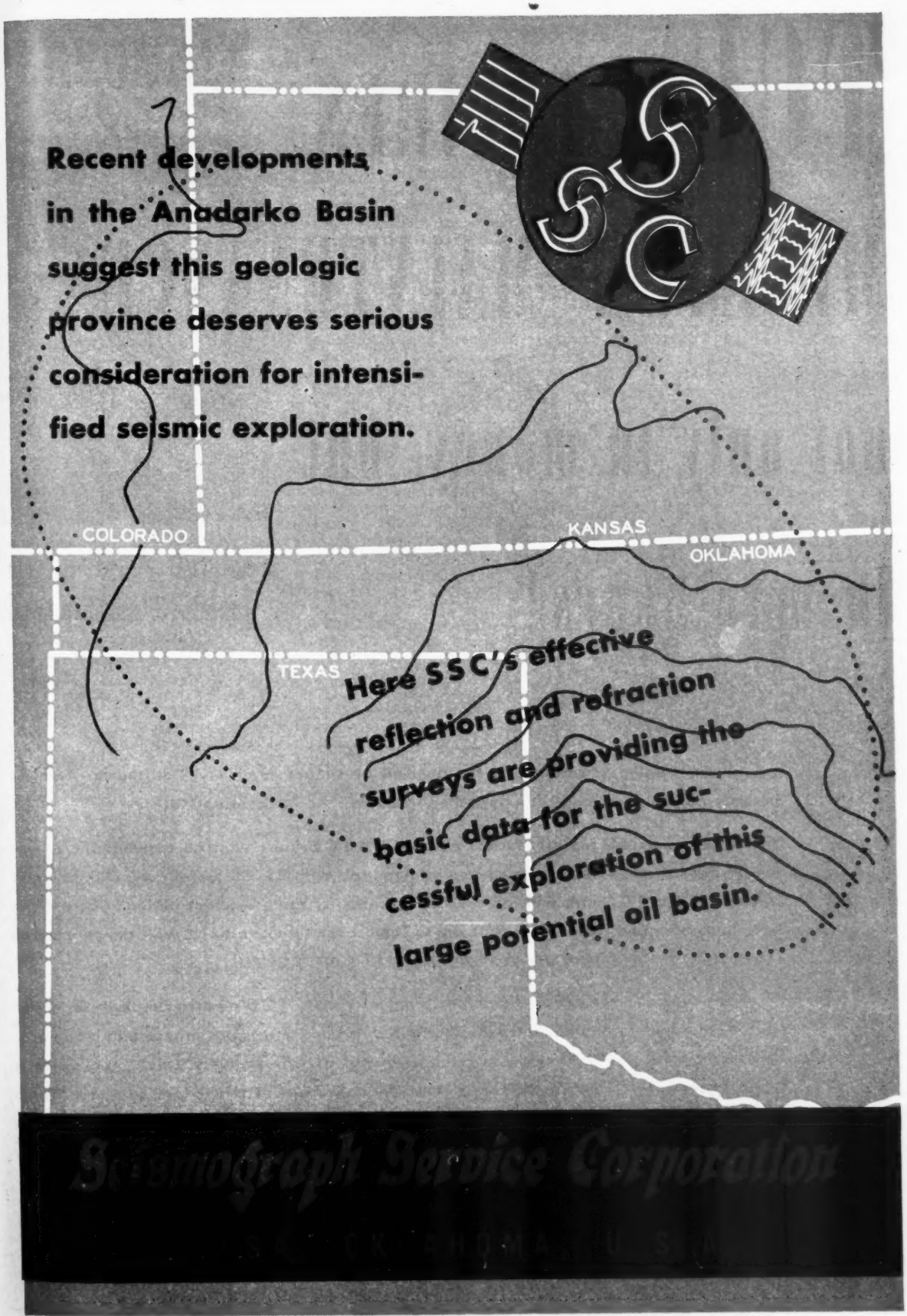
The firm conviction of gas producers that FPC is about to move in on them and regulate their operations and earnings if they sell any gas for interstate transmission was stressed by many witnesses. Among these was John H. Murrell of the Dallas firm of DeGolyer & MacNaughton, petroleum geologists.

Speaking for the pipe-line industry generally, E. Buddrus, Chicago, president of Panhandle Eastern Pipe Line Co., told the committee that the public interest is being jeopardized rather than advanced by the present tendency of FPC to regulate all phases of the gas industry, arguing that it is hampering conservation, retarding expansion of transmission and distribution facilities, and increasing operating costs.

Carter Conducts Tour For Group of Editors

Regional geology, drilling problems, and reservoir-engineering economics of the currently hot area in Garvin and McClain counties, Oklahoma, were explained to a group of 16 newspaper and trade-journal editors by a group of 14 Carter Oil Co. officials in a specially arranged 1-day tour.

Carter officials, headed by President O. C. Schorp, included J. R. McWilliams and H. F. Moses, vice presidents; H. F. Miller, A. H. Mitchell, and C. D. Watson, directors, J. J. Mullane, chief petroleum engineer, H. R. Shannon, division superintendent, R. M. Hurt, assistant division superintendent, R. S. Hincklin, division exploration manager, and members of the public-relations and traffic departments. Joseph Field, mechanical engineer for Sohio Petroleum Co. accompanied the group to discuss the Eola field discovery well of his company.


Recent developments in the Anadarko Basin suggest this geologic province deserves serious consideration for intensified seismic exploration.
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Here SSC's effective reflection and refraction surveys are providing the basic data for the successful exploration of this large potential oil basin.
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In catalytic cracking, it's the over-all on-stream efficiency that counts. And that depends not only on long runs but on short down time for turn-around.

One Houdry licensee recently turned around two TCC units with an expenditure of only 16,000 man-hours. Another turned around two units with 25,000 man-hours. A third turned around a single TCC unit with only 9,700 man-hours. The on-stream periods of these five units had averaged better than 200 days. They were turned around with an expenditure of less than one man-hour per year per barrel of daily thru-put!

These are typical—not extraordinary—examples of how TCC's basic simplicity of design pays off in minimum maintenance. Its shorter turn-around time saves money and man-hours. This is of particular advantage in refining operations of relatively small size, where a single catalytic unit is the only source of high-quality fuel. It is easy for such a refiner to build up, in advance of turn-around, a sufficient backlog of catalytic motor fuel to keep him in production throughout the brief turn-around period.

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PERSONALS

Veteran Heads Humble's Big Louisiana Division

A PRODUCTION man since 1917 and one of the few men who hold 30-year service buttons of Humble Oil & Refining Co., is Clarence Clay Clifton, who heads the company's operations in the rapidly expanding Louisiana division.

Clifton, who headquarters in New Orleans and who superintends operations in Louisiana, Mississippi, Alabama, Georgia, and Florida, entered the oil business in 1911 with the old Blaffer & Farish Oil Co. of Houston.

He remained with Blaffer & Farish until 1917, when that organization was consolidated with other interests to form the present Humble company. In that year he first entered production work, with an assignment in Goose Creek field.

This work was interrupted by World War 1, in which Clifton served in the Army Air Corps. In 1919 he returned to the Humble company and played an important part in the development of the company's interests in the Ranger, Breckenridge, and Cisco areas.

He was assistant division superintendent at Cisco for 6 years, leaving in 1929 to become division superintendent in New Orleans.

He has been in New Orleans since that time. In August 1941 his division was expanded to include Mississippi, Alabama, Georgia, and Florida operations.

His favorite hobby is strictly a local one—that of fishing in the lakes and bayous of South Louisiana.

J. E. Bludworth, formerly technical director for Celanese Corp. at its Bishop, Tex., petroleum - chemicals plant, is now operating as a general chemical consultant to the petroleum and chemical industries with headquarters at 832 Nixon Building, Corpus Christi, Tex.

Albert C. Mattei, president, Honolulu Oil Corp., San Francisco, is one of 13 American business executives who left last week by air to conduct an industrial and export survey of the combined British-American zones in Germany and the American zone of Austria. The group will return to the United States about May 6.

Dr. W. H. Carson, dean of the school of engineering of University of Oklahoma, was awarded an honorary life membership in Southern Gas Association at the association's annual meeting in Biloxi, Miss., in recognition of his contribution to the progress of the industry in the South and Southwest.

J. A. LaFortune, vice president of Warren Petroleum Corp., has been named a director of Public Service Co. of Oklahoma.

Victor Denslow has been promoted to assistant chemical engineer in the Point Breeze refinery of Atlantic Refining Co.

J. H. McQuown, formerly district production engineer for Caribbean Petroleum Co., Maracaibo, Venezuela, and also division production engineer for Shell Oil Co., Centralia, Ill., has returned to the United States to engage in a consulting engineering practice with offices in Austin. His practice will consist of appraisals, evaluations, and secondardy-recovery projects.

Harold McClure, independent operator, has been elected mayor of Alma, Mich.

Arthur W. Trepatz, Shell Oil Co., Inc., scout, has been transferred from Centralia, Ill., to Clinton, Okla.

Charles J. Puls has been named shift foreman in the bulk receiving and shipping division of the Baltimore refinery of Standard Oil Co. of New Jersey.

Walter A. Haas, president, Levi Strauss & Co., San Francisco, has been elected a director of Tide Water Associated Oil Co.

Arthur V. Bourque, former secretary of the Natural Gasoline Association of America and later secretary of Western Petroleum Refiners Association, has joined the Fred Eldean organization to assist in the petroleum industry's public-relations program.

Oscar C. Shorp, president, Carter Oil Co., has been elected to a 7-year term as trustee of the University of Oklahoma Research Foundation. The foundation is a group, separate and apart from the University administration, to administer trust funds, gifts, etc., for research and other purposes.

John V. Bradfield, Lone Star Gas Co. engineer, has been transferred from the Shreveport district to the general engineering department in

Nine international guests were included in the record attendance at the April meeting of the Houston chapter of Nomads. They are: Front row—R. T. Finley, United British Oilfields of Trinidad, Point Fortin, Trinidad; D. C. Scott, Shell Oil Co., Inc., Bogota, Colombia; R. L. Holden, Texas Petroleum Co., Barranquilla, Colombia; Delbert Lewis, Calgary, Alta.; D. U. Skinner, Houston Oil Field Material Co., Caracas, Venezuela. Back row—T. B. Herndon, National Supply Co., Caracas; N. E. Giles, Socony-Vacuum Oil Co., Inc., Caracas; C. B. Miller, Mene Grande Oil Co., Barcelona, Venezuela; Sonny Calvert, export representative, London, England

PERSONALS

Shreveport. **Cicero H. Young, Jr.,** junior engineer, has been transferred from Shreveport to the New Orleans district, and **Howard E. Richardson** has been named assistant manager of the company's Jackson, Miss., district.

Harry J. Hardenberg, petroleum geologist in Lansing for Michigan Conservation Department's Geological Survey Division, has been named head of a newly created mineral-resources section of the division. **Lyle W. Price,** acting head of the Mount Pleasant field office, succeeds Hardenberg and will be replaced at Mount Pleasant by **Kenneth Walsworth,** acting head of the Allegany field office. **Bernard Ackerman** has been named to succeed Walsworth.

F. E. Feaster, assistant operator, cracking, in the Martinez refinery of Shell Oil Co., Inc., has been promoted to head operator. Other manufacturing department promotions and transfers include: **H. E. Hook,** technologist, Wilmington refinery, to foreman, control laboratory, Martinez refinery; **Harold J. Davis, John T. Dixon,** and **Charles E. Jordon,** each from operator A to head operator, Wilmington refinery; and **John S. Ritchie,** from zone supervisor to assistant general foreman, Wilmington refinery.

Crymes Pittman, Shreveport, La., and **Burnie Porter,** Jackson, Miss., engineers and industrial sales representatives for United Gas Pipe Line Co., have exchanged jobs. Pittman's new headquarters will be in Jackson, and Porter will be returned to United's general offices in Shreveport to supervise industrial gas sales in the Shreveport and Munroe districts.

Earle F. Demond, independent operator, has been elected president of the California Stripper Well Association to succeed **V. R. G. Wilbur.** New vice presidents are **V. L. Norman,** general manager, Woolner Oil Corp., Ltd.; **L. A. Donnelly,** vice president, Exeter Oil Co., Ltd., and **Edwin P. Crail,** president, Victory Oil Co. **Thomas H. Work,** Nordon Corp., Ltd., was re-elected secretary-treasurer.

W. L. Woodward, Zenith Gas System, Alva, Okla., was named president of the Southern Gas Association to succeed **Dean A. Strickland,** United Gas Corp., Houston, at the association's meeting last week in Biloxi, Miss. **W. H. Ligon,** Nashville Gas & Heating Co., Nashville, was named vice president, and **L. L. Baxter,** Arkansas Western Gas Co., Fayetteville, Ark., second vice president.

Henderson Supplee, Jr., has been named a vice president of Atlantic Refining Co. and will assume his duties May 6. Since 1938 he has been president of the Supplee-Wills-Jones Milk Co., Philadelphia.

E. S. Holt has been named president of Utah Oil Refining to succeed **T. A. Dines,** who will continue as a vice president and director.

George H. Schoenbaum, former engineering representative in Detroit for Standard Oil Co. of New Jersey, has been transferred to London as the foreign technical representative of foreign marketing coordination for the parent company, Standard Oil Co. (N. J.). Schoenbaum, who expects to leave for London within the next few weeks, was among the first oil men to go into uniform for the Army before hostilities commenced.

Burton C. Dunn and **M. J. Boreing** are forming a partnership to do consulting geological work in Durango, Colo. Dunn is a graduate of the University of Pittsburgh and has been district geologist for Ohio Oil Co. at Wichita, Kans., since 1940. Boreing is a graduate of Colorado University and a former member of the geological department of The Texas Co. and Cities Service Oil Co. More recently, he has been a partner in the firm of Bird & Boreing, Wichita.

W. H. Stirtz, former district geologist for Kerr-McGee Oil Industries, Inc., at Shreveport, La., has been named chief geologist for British American Oil Producing Co., Tulsa. The appointment was effective April 21. **T. C. Hoke,** formerly British American chief geologist, is now manager of exploration, in charge of land and geological departments.

Don A. Miller, western division production superintendent, Phillips Petroleum Co., has been elected chairman of the newly organized Permian Basin chapter, Division of Production, American Petroleum Institute, at Midland, Tex. **R. B. Saxe,** Gulf Oil Corp.; **F. R. Lovering,** Shell Oil Co., Inc., both of Odessa, Tex., and **J. M. Dunlavy,** Skelly Oil Co., Hobbs, N. M., are vice chairmen. **William J. Murray, Jr.,** member of the Texas Railroad Commission, spoke at the organization meeting held last week in Odessa. **John W. House,** Midland, had been acting as temporary chairman of the organization committee.

A. E. Collins has been awarded a three-diamond pin in recognition of his 35 years of service with Shell Oil Co., Inc. Collins is manager of purchasing and stores, Los Angeles.

Garth L. Young, chief engineer, has been elected a vice president of Signal Oil & Gas Co. For some time he has served as a vice president and director of Signal Oil Co., marketing subsidiary.

Shifts

E. C. Yerby, engineer, Richfield Oil Corp., Tupman, Calif., to Long Beach; **Wesley K. Rickel,** engineer, Amerada Petroleum Corp., Lovington, N. M., to Oraibi, Ariz.; **D. A. Davidson, Jr.,** engineer, Pan American Production Co., Raymondville to Lyford, Tex.; **J. L. Hoyt, Jr.,** superintendent, Pan American Production Co., Raymondville to Lyford, Tex.

Harry E. McDonald, engineer, Shell Oil Co., Inc., Eastland, Tex., to Dallas; **Richard A. Pohly,** geologist, Global Exploration Co., Denton to Floydada, Tex.; **H. W. Swaim,** engineer, Continental Oil Co., Bowie, Tex., to Wichita Falls; **R. M. Wemple,** engineer, Pan American Production Co., Raymondville to Lyford, Tex.; **James A. Parry,** superintendent, Sunray Oil Corp., Hebbronville to Bruni, Tex.; **Foster M. Monahan,** geologist, Stanolind Oil & Gas Co., Midland, Tex., to Houston.

J. F. Neill, superintendent, The Texas Co., Odessa to Midland, Tex.; **H. J. Geoghegan,** superintendent, The Texas Co., San Antonio to New York; **Robert B. Campbell,** geologist, Miami, Fla., to Gulf Hammock, Tex.; **J. M. Hughes,** foreman, United Gas Pipe Line Co., Oakdale to Crowley, La.; **L. P. Bristley, Jr.,** geologist, Gulf Research & Development Co., Monroe, La., to Hattiesburg, Miss.

W. C. Patton, superintendent, General Geophysical Co., Mattoon, Ill., to Henderson, Ky.; **H. N. Lewis,** superintendent, Ohio Oil Co., Olney to Bridgeport, Ill.; **E. L. Wells,** foreman, Continental Oil Co., Grenada, Miss., to Henderson, Tex.; **James P. Shambaugh,** engineer, Socony-Vacuum Oil Co., Inc., Woodbury, N. J., to Huntington, N. Y.; **Dewey Norris,** superintendent, Helmerich & Payne, Inc., Russell, Kans., to Allred, Tex.

L. H. Simpson, superintendent, Helmerich & Payne, Inc., Garden City, Kans., to Acadia, La.; **W. E. Ware,** geologist, The California Co., Kemmerer, Wyo., to Yuma, Colo.; **Paul Weirich,** foreman, Phillips Petroleum Co., Glenrock to Lander, Wyo.; **J. A. Ziser,** engineer, Continental Oil Co., Lusk, Wyo., to Denver, Colo.; **D. D. Moore,** geologist, Seismic Exploration, Inc., Cordell, Okla., to Farmerville, La.; **J. H. Marsee,** engineer, Phillips Petroleum Co., Kaw, Okla., to Odessa, Tex.

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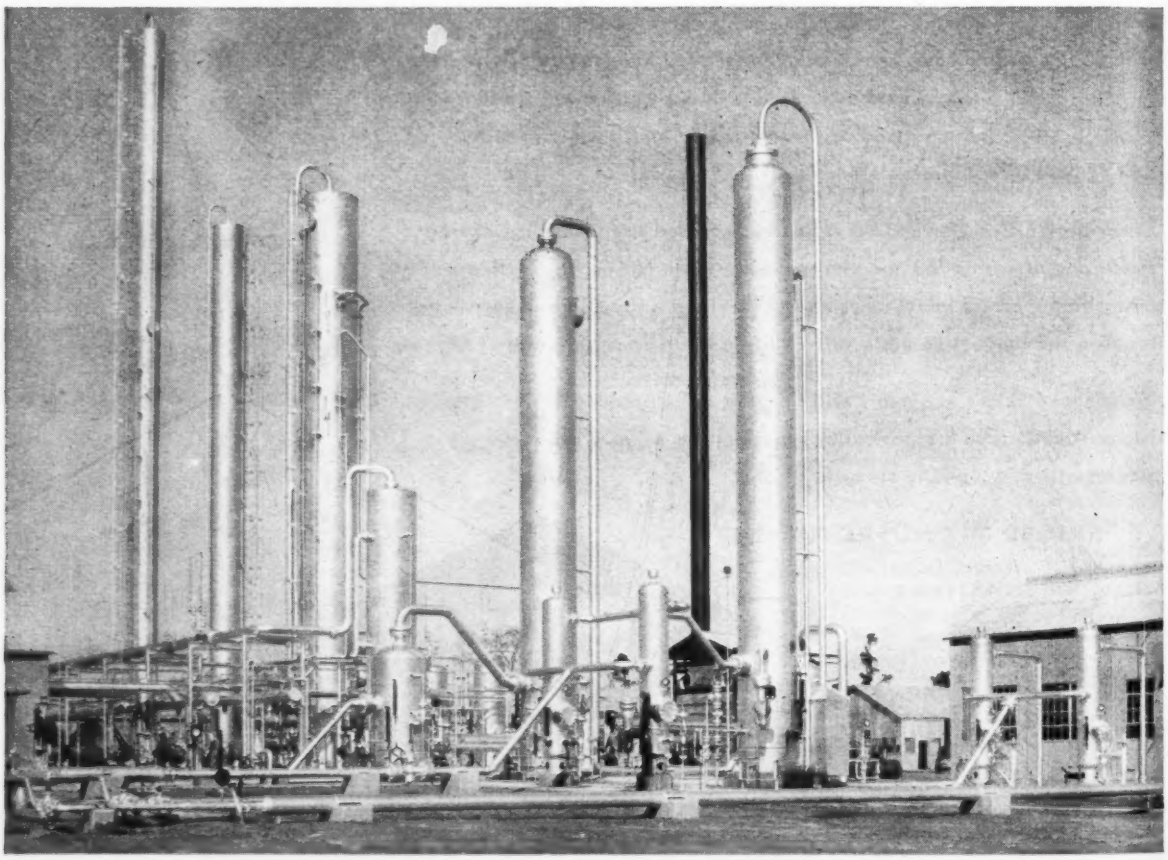

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Hanlon Award Conferred on W. K. Warren by N.G.A.A.

W. K. WARREN, president, Warren Petroleum Corp., Tulsa, is the 1947 recipient of the Hanlon Award, highest honor in the natural-gasoline and cycling industries. Presentation was made at the twenty-sixth annual convention of the Natural Gasoline Association of America held this year at Dallas. Warren is the eleventh recipient of the award, which is sponsored by the N.G.A.A. for outstanding service to the natural-gasoline and cycling industries. This yearly award was established by E. I. Hanlon, for many years active in the natural-gasoline industry.

Presentation was made by J. H. Dunn, president of the association, and it read in part: " . . . This man grew up with the natural-gasoline industry and played an outstanding part in broadening and stabilizing the markets for its products. His sponsorship and financing of a huge storage program enabled many manufacturers, from whom he purchased their annual output, to continue operating their plants in times when other demand for their products had reached the vanishing point."

A native of Nashville, where he also received his education, Warren came to Oklahoma in 1916 and followed the oil booms in Burkburnett and Breckenridge, Tex. In 1921 he returned to Tulsa to head the oil and gas department of Gilliland Oil Co. A year later he opened his own office and became the first sales representative dealing solely in products of natural-gasoline plants. From this beginning came Warren Petroleum Corp., now celebrating its twenty-fifth anniversary, which is one of the largest producers and marketers of natural-gasoline products in the world. Warren is also president of Warren Maritime Corp., board chairman of Warren Oil Corp., and Warren Pipe Line Co. He is a director of the American Petroleum Institute.

W. K. WARREN

Gulf Says Kuwait Output To Be Doubled This Year

An expansion program destined to more than double production in Kuwait this year and quadruple it by the close of 1948 is revealed by W. L. Mellon, chairman of the board of Gulf Oil Corp., and J. F. Drake, president, in the company's annual report.

Kuwait Oil Co., Ltd., in which Gulf is a joint partner with Anglo-Iranian Oil Co., Ltd., plans to complete between 25 and 30 wells in Kuwait this year and to complete more next year.

Production is scheduled to be increased from the present output of 40,000 to 100,000 bbl. daily by the end of 1947 and 160,000 bbl. daily by the end of 1948.

A large amount of exploration also is scheduled in the company's "large holdings of undeveloped acreage" in Canada, Venezuela, Colombia, Nicaragua, Cuba, the Bahamas, and Denmark, the report said.

DEATHS

G. F. Pratt, president of Crystal Refining Co., Carson City, Mich., died recently.

Harry Everett Bruner, 77, early day Pennsylvania operator and later field superintendent in Oklahoma for Chestnut & Smith, oil operators, until his retirement 12 years ago, died April 20 in a Tulsa hospital.

Waldo Moutray, 49, partner in Moutray-Moore Drilling Co. and an oil operator 27 years, died April 15 in Abilene, Tex.

W. H. Say, 75, pioneer oil operator in western Pennsylvania fields, died recently in Zelienople, Pa.

Argyle William Tucker, 57, driller in East Texas fields for the last 25 years, died April 14 in an automobile accident en route to his home in Grand Prairie.

Frank Sutton, 81, vice president of Belridge Oil Co., died recently at his home in Beverly Hills, Calif.

Charles E. Burns, chief engineer of the Longview, Tex., compressor station for Lone Star Gas Co., died recently.

H. S. Hansen, 47, oil operator, died April 13 at his home in Olney, Tex.

George D. Yetter, 61, accountant with British American Oil Producing Co., died April 16 in Tulsa.

Elijah Paul Wilburn, 64, Houston drilling contractor, died April 15 in a Houston hospital.

Harrison Hammond Anderson, 77, retired driller and operator and a veteran of 50 years in the oil business, died recently at his home in Chatham, Ontario.

Milton Roy Sheen, 63, president and cofounder of Milton Roy Co., pump manufacturers, died recently at his home in Glenside, near Philadelphia. In 1919 he was awarded the Edward Longstreth medal for meritorious work in science and invention by the Franklin Institute.

D. F. Dickey, 77, who retired in 1937 as chief clerk in the land department of The Texas Co., died April 20 at his home in Tulsa.

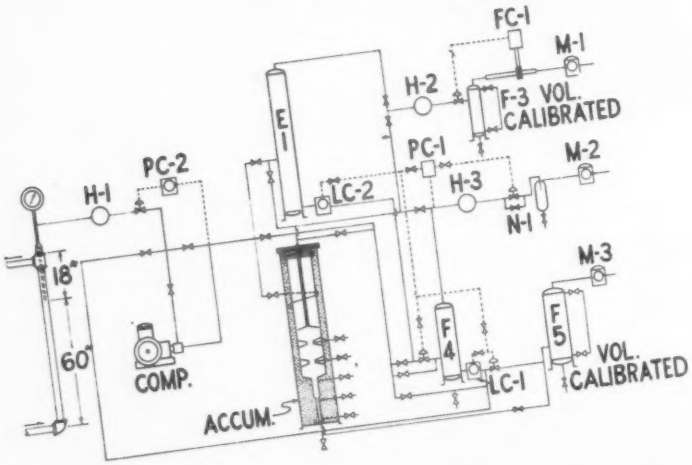
Fred F. Nigh, 66, independent operator, died April 15 at his home in Houston.

Pell William Foster, 85, a director of Foster-Wheeler Corp., New York, died April 20 on a train en route from Tucson, Ariz., to New York.

Natural Gasoline SECTION starts here

Mobile Laboratory for Gas-Condensate Studies

Above is seen a general side view of Atlantic Refining Co.'s mobile laboratory, flow sheet of which is seen in Fig. 1, below

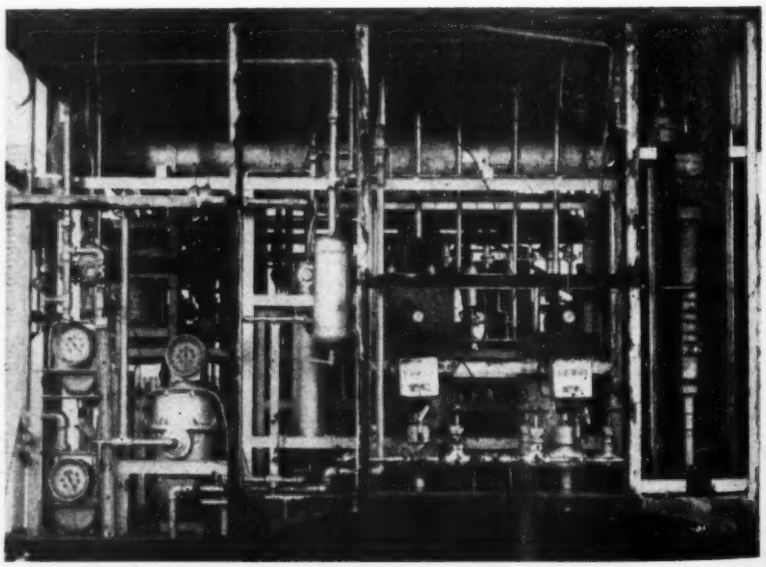


by E. H. Koepf

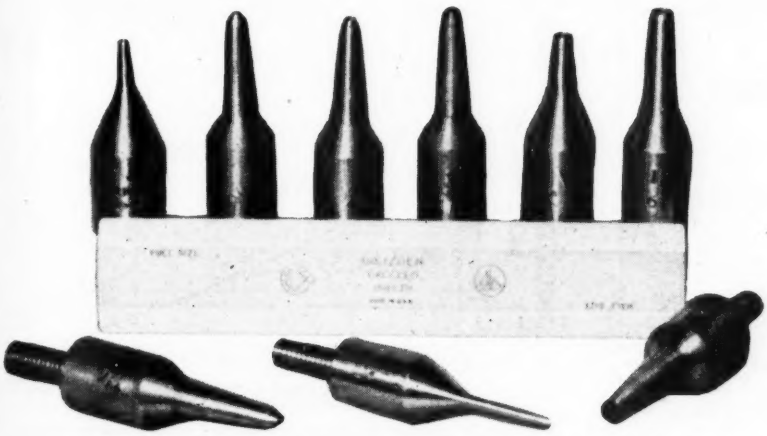
The author, research engineer for Atlantic Refining Co., Dallas, presented this paper before the twenty-sixth annual convention of the Natural Gasoline Association of America, held at Dallas on April 23-25. The article describes a mobile laboratory equipped to study various problems relating to gas and gas-condensate systems and presents the data obtained in two gas-condensate fields.

THE mobile laboratory being used in current gas-condensate phase studies was originally constructed for use as a high-pressure absorption pilot unit for use in field studies of gas-condensate systems from the standpoint of aboveground recovery methods. One of the objectives in operating a mobile laboratory is to provide a means of obtaining a sample directly from the well stream and of processing it without contamination or removal of some constituents, such as H_2S, and to permit operation on a continuously flowing, dynamic system. The unit was used in studies of absorption at 1,500 to 3,000 psi., and equipment for these studies up to 6,000 psi. is mounted in the unit.

Aboveground recovery methods include only a few of the factors which must be considered in evaluating a cycling project, and information regarding the properties of the reservoir materials is usually of equal or greater importance. Because of this a special compressor and an accumu-



General view of accumulators, flash drums, and gas meters



Sharp-edged nozzles which are inserted into vertical flow lines in sampling two-phase well streams

lator unit have been installed on the mobile laboratory in order to provide a means for obtaining types of information such as:

1. Determination of phase condition of reservoir fluid under original reservoir temperature and pressure.

2. Determination of dew-point pressures of rich-gas systems to within about 50 psi.

3. Determination of the amount and composition of liquid condensation which occurs in a reservoir as a function of pressure decline during the normal depletion of gas-condensate reservoirs and the composition of the gas which will be produced during the operation.

4. Determination of pressure, temperature, per cent liquid relationship for gas-condensate systems.

This equipment has recently been used to study liquid condensation from a gas-condensate system as a function of reservoir-pressure decline and to determine initial phase conditions in a system where there is question as to its state in the reservoir. Studies of the former type are planned for a number of reservoirs. In addition to the information on reservoir fluid behavior, some data relating to the sampling of two-phase flow streams have been obtained.

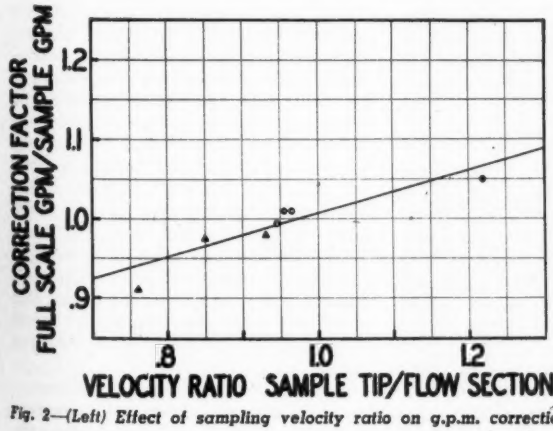
Description of Equipment

This mobile unit is mounted on a 223-in. wheel-base truck. The truck body is divided into three compartments. The engine room contains a 40-hp. engine which drives a 3-phase, 12-kva. generator, an instrument air compressor and the special gas compressor. It also contains an electric-motor-driven lean-oil pump, the refrigeration compressor, and fuse banks for the electrical system. The control compartment is located between the engine room and the pilot unit compartment and contains instruments for control of flows, pressures, and liquid levels. In addition, a 40-point indicating potentiometer, control equipment for the electrical system, and indicating pressure gages are included in this compartment. The rear compartment of the unit contains all of the high-pressure vessels, pipes, and valves through which the hydrocarbons flow. In this section all of the streams are maintained at the desired conditions of temperature and pressure and separated into the proper products.

The gas compressor and accumulator have recently been added to the unit and incorporated in such a way that various units can be bypassed or included in the flow system as desired. The alterations were made so as to permit the use of present control instruments whether operating the absorption system or the compressor and accumulator systems. The gas compressor operates with a belt drive from the 40-hp. engine, has two ¾-in.-diameter cylinders, and a capacity of 1,200 standard cubic feet per hour with suction at 2,000 psi. and discharge at 6,000 psi. Liquid portion of the system furnishes the only lubrication for the compressor pistons.

The accumulator in which liquid condensation is detected and measured consists essentially of a vessel into which the preheated well-stream sample is brought through a packed section and allowed to separate, with the vapors passing out the top and the liquid collecting in the bottom portion. It is built in accordance with the design developed by the Bureau of Mines[1], the chief difference being that an additional, smaller liquid-accumulation chamber is provided instead of the glass-window compartment for detecting dew points and measuring low rates of liquid accumulation. The bottom portion of this vessel is divided into four chambers, each succeeding chamber from the bottom upward containing a greater volume.

Needle valves with very fine openings are inserted into each of the four sections and the volume between each two succeeding needle valves can be calibrated for measuring the amount of accumulation from one valve to the next. The smallest volume is about 10 cc. and a total



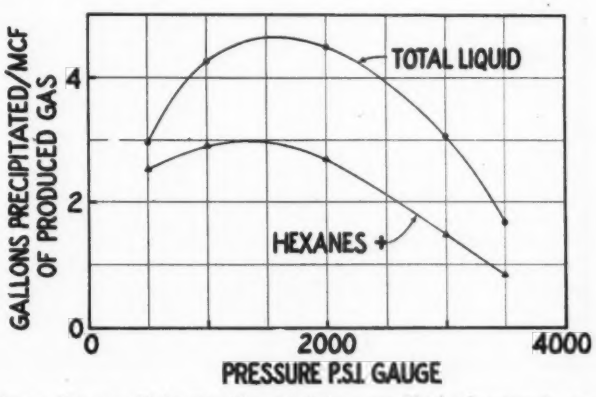


Fig. 2—(Left) Effect of sampling velocity ratio on g.p.m. correction factor. Fig. 3—(Right) Liquid precipitation per M.c.f. of reservoir gas produced at various pressures

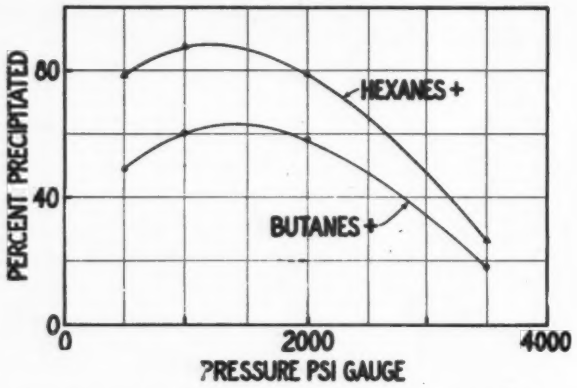


Fig. 4—Per cent of original reservoir fluid content precipitated with pressure decline

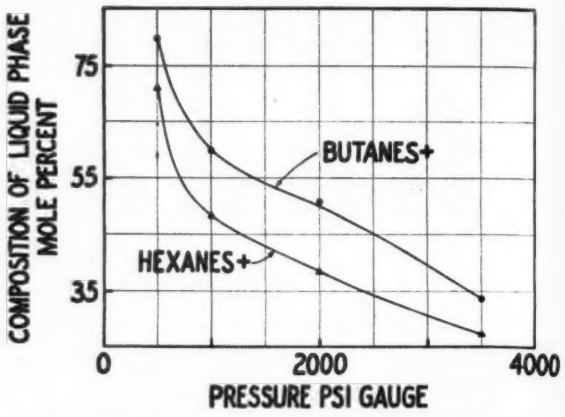


Fig. 5—Composition of liquid precipitated with pressure decline

accumulation of about 1,000 cc. can be measured. Liquid level is determined by leaving the needle valve cracked open slightly and noting the type of material which comes out. As long as gas is present the valve effluent is chiefly a gas, but when liquid reaches the valve, its presence is easily detected both by the sound resulting from the flow of the material through the needle valve and the frothy appearance of the effluent.

The rate of liquid accumulation in terms of the flowing well stream can be determined by noting the time required for the liquid to accumulate from one needle valve to the next and correlating this quantity with the rate of gas flow. This entire unit is immersed in a constant-temperature bath which can be maintained at any desired temperature up to about 300° F. Three heating elements are utilized to bring the bath to temperature, and one unit operating on temperature control maintains the temperature at the desired level. A motor-driven stirrer provides agitation for thorough mixing of the oil to insure uniform temperature distribution.

Field Operations

Sampling and checking gas - oil ratio.—During the past few years, a considerable amount of work has been done under the auspices of the Natural Gasoline Association of America on the proper method of sampling two-phase well streams and the effect of sampling conditions on the degree to which the sample represents the actual well stream.[2,3] Present work done with this mobile unit has utilized a sharp-edged nozzle inserted into a vertical flow line. An accompanying illustration shows an assortment of the nozzles used.

Fig. 1, which presents a schematic diagram of the sampling arrangement, shows that the vertical line has been, in every case, at least 6 ft. in length and the sampling tip is inserted on an 18-in. section of ½ in. xx heavy pipe. This pipe is welded into a 2-in. bull plug which is screwed into a T at the top of the 6-ft. vertical flow section. Sampling rates and sample tip sizes are usually chosen to give gas flow through the unit of 300 to 600 cu. ft. per hour, and a ratio of flow through the nozzle to the flow through the well stream is determined for each case so that the gas-oil ratio obtained in the mobile unit is essentially equal to the field gas-oil ratio. The effect of changes in rate of sampling upon gas-oil ratio, as obtained with the sharp-edged orifice and sampling procedure described above in the limited amount of work done to date, are summarized in Fig. 2.

The results shown in Fig. 2 were obtained in operations in two different fields. In each case the total gas flow was 1.3 to 1.5 million cubic feet per day and gas-oil ratios were 12,000 to 14,000 CF/bbl. Ratios obtained in the mobile unit represent 1 to 4-hour operating periods. The results obtained in these two cases appear to be relatively consistent and indicate that a sample of unit correction factor (ration of g.p.m. in flow stream to g.p.m. in sample stream) is obtained with a velocity ratio (sample tip to flow stream) of 0.97. This value is in substantial agreement with the results obtained in studies made at Katy and Erath[2,3] which indicate a ratio of velocity in the sample tip to stream velocity of 0.94. The circled points of Fig. 2 represent runs where samples were taken from a blowing stream at pressures somewhat greater than 4,000 psi., under which conditions the correction factor would not be expected to change appreciably with variations in flow rate of 10 per cent or less.

The first step in starting a field study has been to check the accuracy of the sample being obtained by comparing the gas-oil ratio obtained in the mobile unit with the field gas-oil ratio. In addition to this preliminary check the unit is so arranged that the gas-oil ratio can be periodically checked during most of the operations. Special effort has been made to provide sufficient flexibility in the laboratory equipment to duplicate field separator conditions. Fig. 1 presents a simplified flow sheet of the unit.

In checking the gas-oil ratio, the compressor unit is bypassed and the well stream sample is brought directly into the stabilization system. If there is an appreciable amount of water in the flowing stream, it can be charged into a water separator (not shown in Fig. 1) where the water separates and is drawn off through a water leg, and any liquid hydrocarbons are recombined with the vapors taken overhead from the vessel. It is preferable to bypass this vessel in order to prevent the separation of hydrocarbon liquids and vapors and the possible introduction of errors in recombining these two phases before charging to the stabilization system.

The path of the materials during staging is determined upon the basis of actual field operations. If field separation is accomplished in two stages plus stock tank flash, then the well stream can be charged directly into the E-1 tower which is maintained at a pressure corresponding to the first stage of field separation, and from here the liquid can be flashed through towers F-4 and F-5 where pressures correspond to the second stage and atmospheric flashes. If the field operations involve only a single flash before flow to storage tanks, then the stream can be charged directly to the F-4 tower which is maintained at the field separator pressure, and the separator liquid then flashed through tower F-5 at atmospheric pressure.

Control and Direction of Flows.—In this gas-oil ratio determination procedure, as in all operations with

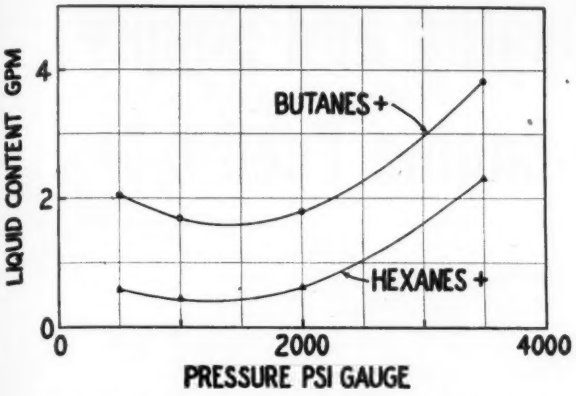


Fig. 6—Liquid content of reservoir gas at various pressures

the unit, most of the operating variables are controlled automatically. The pressure on the E-1 tower, which can be operated up to 6,000 psi., is automatically controlled by PC-2 which regulates the flow of gas to the tower. Pressure of operation of tower F-4 is controlled by PC-1 which can be made to activate either a valve which allows the stream to enter the tower or a valve which permits gas to leave the top of the tower.

In cases in which F-4 is the primary stage of separation, pressure is maintained by regulating the flow of gas into the tower with PC-1 for a predetermined rate of gas exit. When F-4 is used as a second-stage separator, PC-1 controls the rate of gas exit and the inlet valve is activated by liquid level control from tower E-1. The rate of flow through the system is controlled by FC-1 which regulates the rate of gas exit from the system. Under some conditions of operation FC-1 controls the gas flow from the top of the E-1 tower, but when the accumulator is being used the accumulator gas flows from F-4, through F-3 where the rate is controlled by FC-1.

In addition to the possible interchange of automatic control points, still greater flexibility is gained by the presence of bypasses around most portions of the equipment. The automatic controls are connected in such a way that they can still operate, in most cases. For example, if E-1 is used as a primary separator the liquid from E-1 may bypass the F-4 tower and be charged directly into the F-5 tower. The instruments are connected in such a way that LC-2 on the E-1 tower activates the valve for LC-1 on the F-4 tower to regulate flow from E-1 to F-5. In a similar manner various other units can be used or bypassed as desired.

In cases in which it is desirable to measure the volume of liquid or to determine phase condition of a well stream at pressures in excess of the well-head pressure, the compressor is used in conjunction with the accumulator in order to obtain the desired pressure. When the compressor is used, pressure controller PC-2 can be used to regulate the compressor discharge pressure and tower E-1 either is bypassed or floats in the system as a surge tank to smooth out pressure fluctuations in the compressor discharge. In following reservoir-pressure decline, the pressure of operation in the mobile unit will fall below well-head pressure, and for these conditions the well stream sample bypasses the compressor and flows directly to the accumulator.

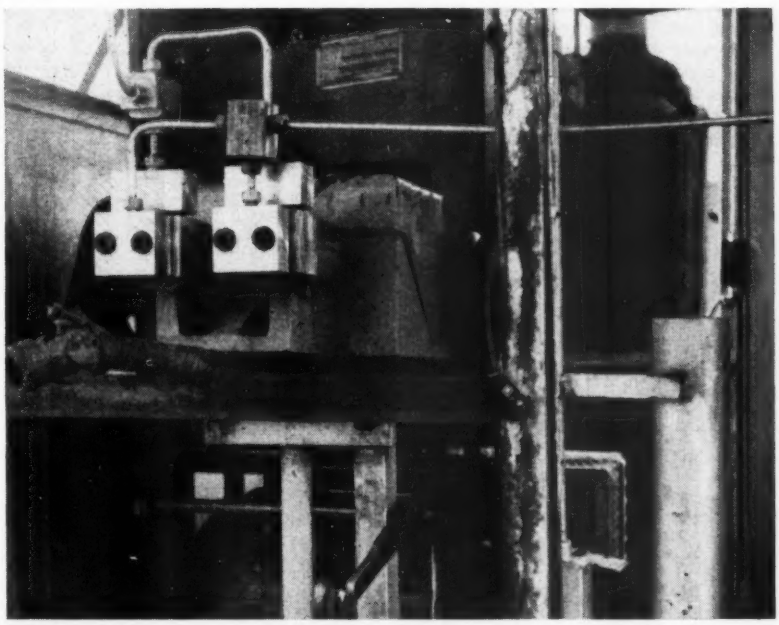
As an example of the use of the unit to study liquid condensation from a gas-condensate system as a function of reservoir pressure, a series of runs was made covering a pressure range of 3,750 to 500 psi. The runs were made after several years of field operation and after an appreciable amount of condensation had occurred. The procedure in this case was to reproduce dew-point conditions of the material being produced from the well by recompressing the well stream sample to reservoir pressure at the time of sampling and heating it to reservoir temperature. Liquid condensation as a function of pressure was then determined by dropping the accumulator pressure in 500-psi. steps and determining the amount of condensation from a well-stream sample at each pressure level. In carrying out this work, both when the compressor was being used to recompress the sample to pressures greater than the well-head pressure and for cases in which the well stream flowed directly into the accumulator, the accumulator pressure corresponded to future reservoir pressures.

In all of these runs the overhead vapors from the accumulator, which correspond to well-stream production at various future reservoir pressures, were charged to the F-4 tower which

(Continued on page 135)

TABLE 1—EFFECT OF SAMPLING VELOCITY RATIO ON G.P.M. CORRECTION FACTOR

Run No.	Velocity ratio sample tip flow section	Gas-oil ratios		G.p.m. correction factor Full-scale G.p.m. Sample G.p.m.
		Sample	Field Sep.	
1	0.963	14,300	14,180	1.010
2	0.945	13,700	13,780	0.995
3	1.222	14,480	13,800	1.05
4	0.954	14,100	13,900	1.01
5	0.93	11,480	11,260	0.98
6	0.76	10,780	11,830	0.912
7	0.85	11,678	11,920	0.977



View of compressor, showing general construction

Factors Affecting Quality and Supply Of Combustion-Engine Fuels

by W. M. Holaday, R. E. Albright, T. L. Apjohn and E. F. Miller

IN the first section of this paper consideration is given to past, present, and future petroleum product supply and demand.

Fig. 1 presents graphically the trend in consumption of all petroleum products in this country from 1925 through 1946 and an estimated trend through 1960. In the past 20 years consumption has more than doubled, reaching a figure of 4¾ million barrels per day in 1946. The demand is expected to increase another 15 per cent to a level of 5½ million barrels per day within the next 10 to 12 years. Contrary to expectations, petroleum-product demand was higher in 1946—the first full peacetime year—than during the war.

The disposition of the principal products making up these consumption figures is shown in Fig. 2 for the years 1904 to 1946 with estimates for 1960. It shows the change during the first World War in the major objective of the petroleum refiner from the production of kerosene to that of gasoline. Gasoline production now amounts to about 42 per cent of the total. Fuel oils now account for 40 per cent, kerosene 6 per cent, lubricants 4 per cent and miscellaneous products—including such materials as solvents, waxes, asphalt and road oils—about 10 per cent. Changes in these relative figures in the next 10 to 15 years will be small, with a slight trend, percentage-wise, toward increased gasoline and distillate-fuel-oil production at the expense of residual fuels.

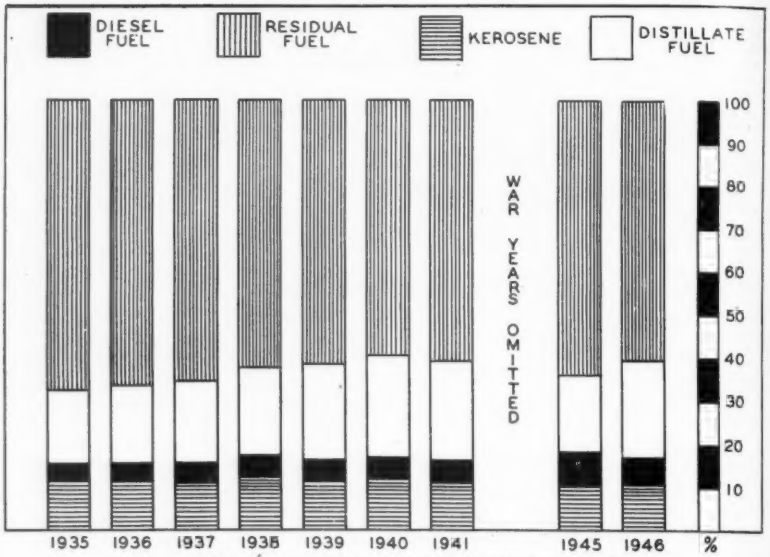
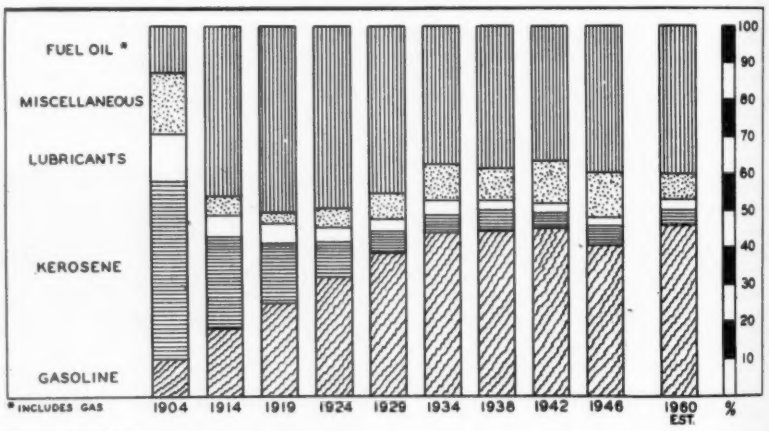


Fig. 2—Relative consumption of principal petroleum products



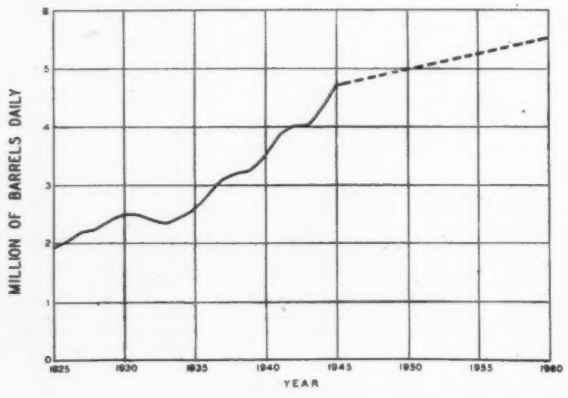


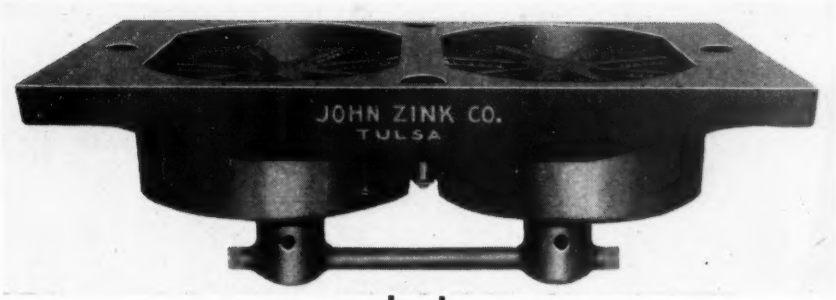
Fig. 1—(Left) Consumption of petroleum products in the United States

Fig. 3—(Above) Fuel-oil distribution by type of stock

As background for the subsequent review of quality trends, a few comments on the individual components of fuel oils and gasoline and their sources should be made.

The information in Fig. 3 indicates that fuel-oil consumption centers about four basic products—kerosene, diesel fuel, distillate fuel oil, and residual fuel oil. The latter product accounts for over half the total production in this category and corresponds to somewhat more than 20 per cent of total petroleum product consumption. Distillate fuel accounts for another 25 per cent and, along

JOHN ZINK BURNERS



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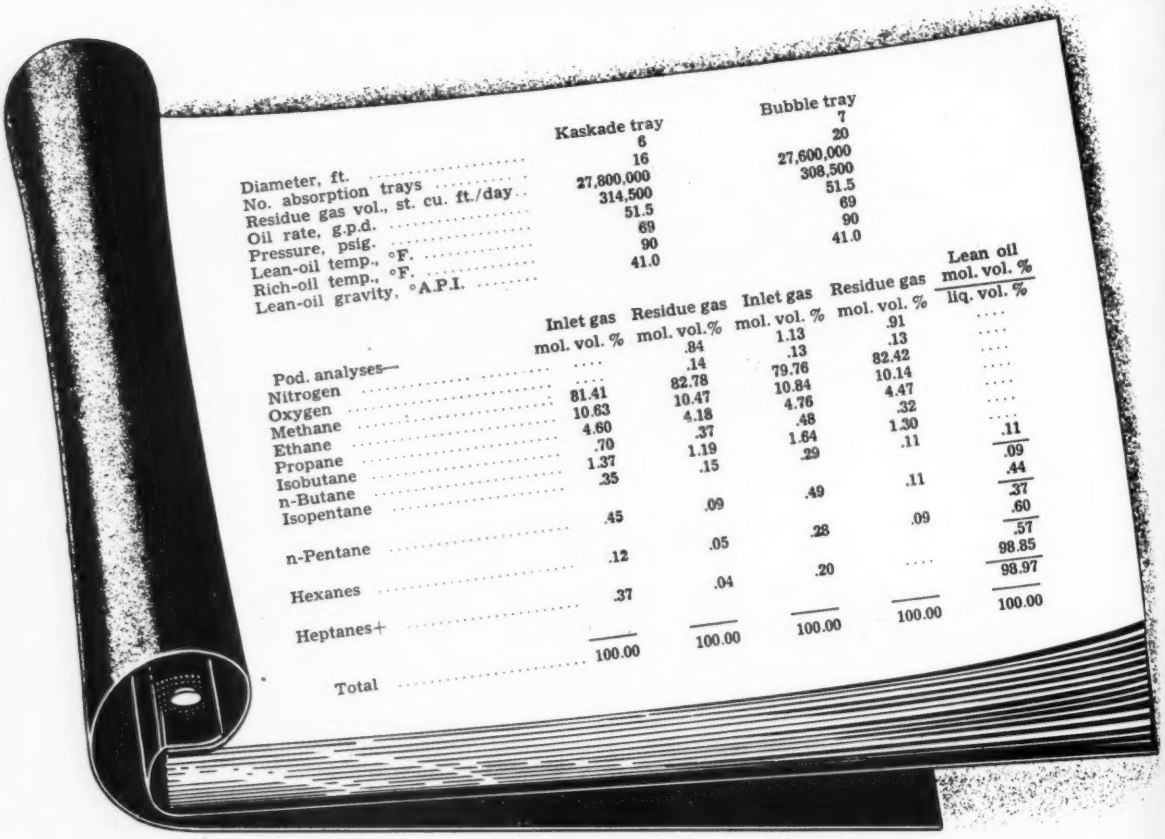
TESTS AT NATURAL GASOLINE PLANT

Prove Koch Kaskade Fractionating Trays Give 36% Greater Capacities with 20% Fewer Trays



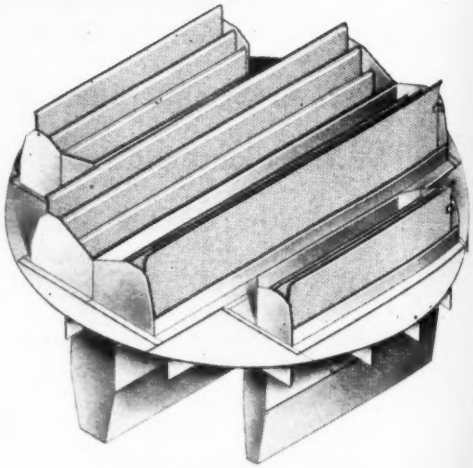
	Kaskade tray	Bubble tray
Diameter, ft.	6	7
No. absorption trays	16	20
Residue gas vol., st. cu. ft./day	27,800,000	27,600,000
Oil rate, g.p.d.	314,500	308,500
Pressure, psig.	51.5	51.5
Lean-oil temp., °F.	69	69
Rich-oil temp., °F.	90	90
Lean-oil gravity, °A.P.I.	41.0	41.0

Pod. analyses—	Inlet gas mol. vol. %	Residue gas mol. vol.%	Inlet gas mol. vol. %	Residue gas mol. vol. %	Lean oil mol. vol. % / liq. vol. %
Nitrogen	....	.84	1.13	.91	....
Oxygen	....	.14	.13	.13	....
Methane	81.41	82.78	79.76	82.42	....
Ethane	10.63	10.47	10.84	10.14	....
Propane	4.60	4.18	4.76	4.47	....
Isobutane	.70	.37	.48	.32	....
n-Butane	1.37	1.19	1.64	1.30	...
Isopentane	.35	.15	.29	.11	.11
n-Pentane	.45	.09	.49	.11	.09
Hexanes	.12	.05	.28	.09	.44
Heptanes+	.37	.04	.20	....	.37
Total	100.00	100.00	100.00	100.00	.60
					.57
					98.85
					98.97
					100.00

This comparison between Koch Kaskade trays and conventional bubble trays was obtained from commercial operations in a natural gasoline plant where a 6-foot diameter, 16-Kaskade tray absorber is operated in parallel with a 7-foot diameter, 2-bubble tray absorber. When these absorbers are operated at approximately their maximum capacity without excessive entrainment, the load carried by each tower is the same.

The operating conditions and gas analyses are given in Table 2 for one test. *These figures show that the Koch Kaskade tray capacity is 36 per cent greater than that of the bubble tray and the tray efficiency approximately 25 per cent greater, based on substantially the same gasoline recovery with both towers.*

We'll be glad to send you Bulletin No. 101 illustrating the Koch Kaskade tray in detail.



Complete assembly view of 6-foot Kaskade tray

U. S. PATENT NO. 2,401,569

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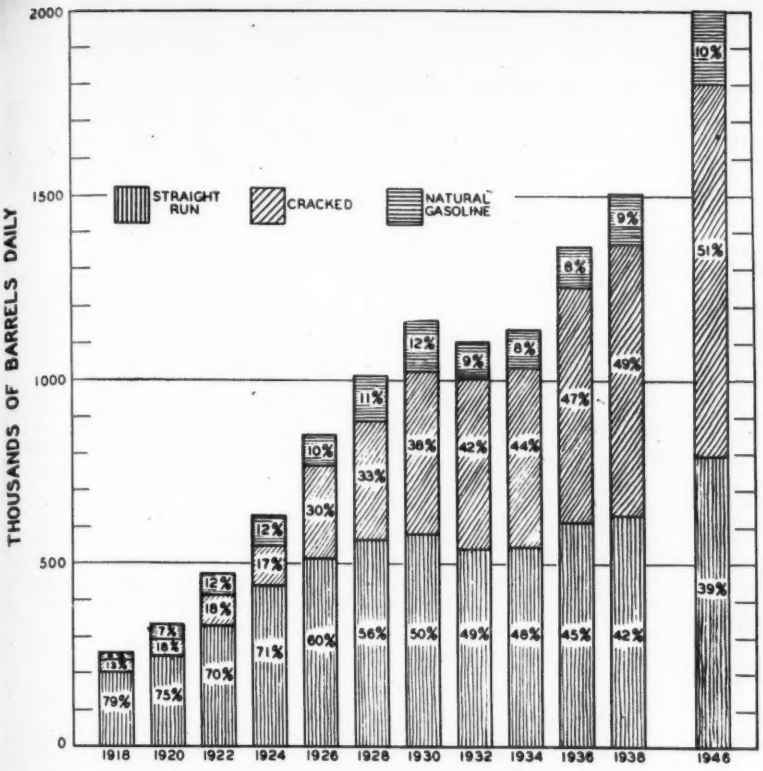

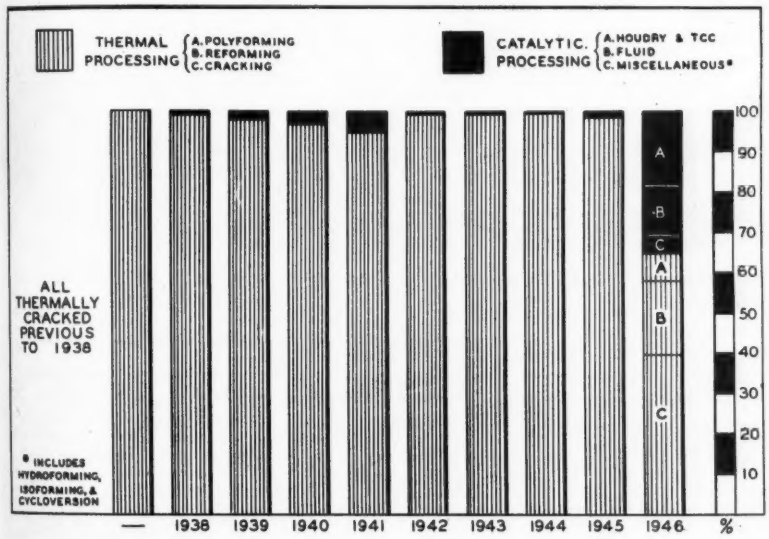

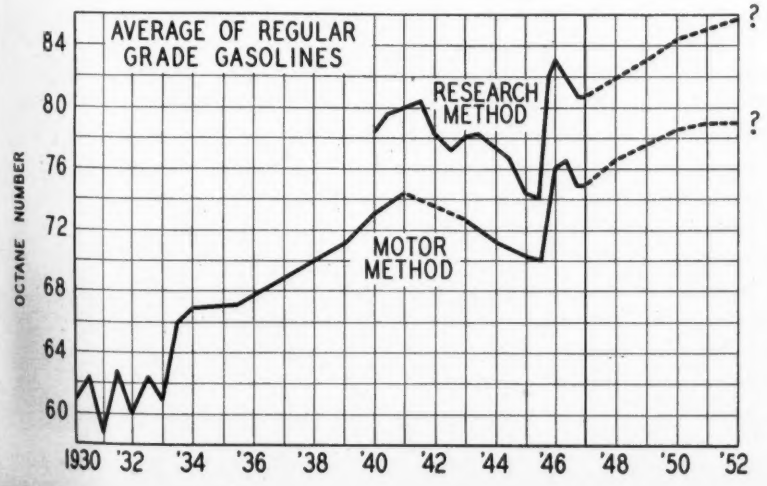

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The accompanying article is a shortened version of a paper presented at the twenty-sixth annual meeting of the Natural Gasoline Association of America, Dallas, April 23-25. The authors are all associated with Socony-Vacuum Oil Co., Inc., New York City. Holaday is director of research for the company.

with diesel-fuel usage, has increased consistently. In contrast, residual-fuel usage has been declining percentage-wise except during the war years when substantial additional quantities were required largely for Naval and Marine activities.

The rapidly expanding application of diesel equipment suggests a more detailed examination of prewar and estimated postwar utilization of diesel fuels. Table 1 shows the relative domestic demands for diesel fuel for the year 1939 and the estimated demands for 1948. The most startling factor in the doubled yearly consumption from 1939 to 1948 is a 6-fold increase in demand by the railroads, percentage-wise, or 10-fold increase volume-wise.

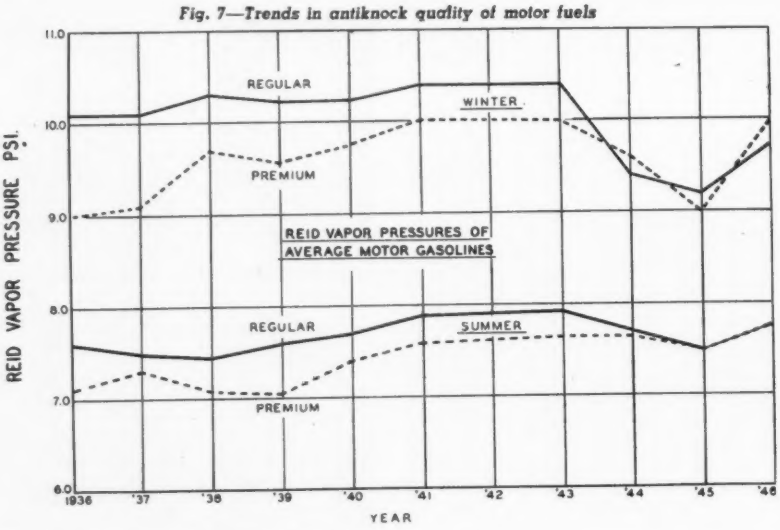
Gasoline consumption falls principally into the motor and aviation grades. Prewar, aviation gasoline was less than 1 per cent of the total. During the war this figure increased to about 35 per cent. In the next 5

Fig. 4—(Top) Consumption of motor fuel in the United States, showing expansion of cracking

Fig. 5—(Center) Cracked motor gasolines, distribution according to type

Fig. 6—(Bottom) Trends in antiknock quality of motor fuels

Fig. 7—Trends in antiknock quality of motor fuels



years it is estimated aviation gasoline consumption will be in the range of 5 to 6 per cent of the total gasoline produced.

The consumption of motor gasoline in the United States is shown in Fig. 4 for the years 1918 through 1946. This increase in consumption of 8-fold in a period of less than 30 years has been made possible only by decomposition — cracking — of heavier stocks so that now the composite finished motor fuel contains slightly more than 50 per cent of cracked components.

Considering further the utilization of cracked stocks for motor fuel, Fig. 5 indicates the relative portion of thermally cracked and catalytically cracked gasolines. The latter process was introduced commercially in 1936, but its contribution to motor-gasoline production has been relatively insignificant until the postwar period. The catalytic cracking capacity at the outbreak of the war and that built during the war was used primarily for the production of aviation-gasoline blending stocks. The 10-fold increase in catalytic cracking capacity during the war now yields about 18

(Continued on page 120)

TABLE 1—RELATIVE DOMESTIC DEMANDS FOR DIESEL FUEL

	Per cent of total	
	1939	1948
Vessels	59.1	28.6
Gas and electric companies	6.4	7.4
Manufacturing and mines	6.1	13.0
U. S. Army, Navy and Coast Guard	4.5	6.1
Railroads	4.5	24.5
Miscellaneous*	19.4	20.4
	100.0	100.0
Volume consumption, thousands of bbl. per year	24,000	49,000

*Includes trucks and buses.

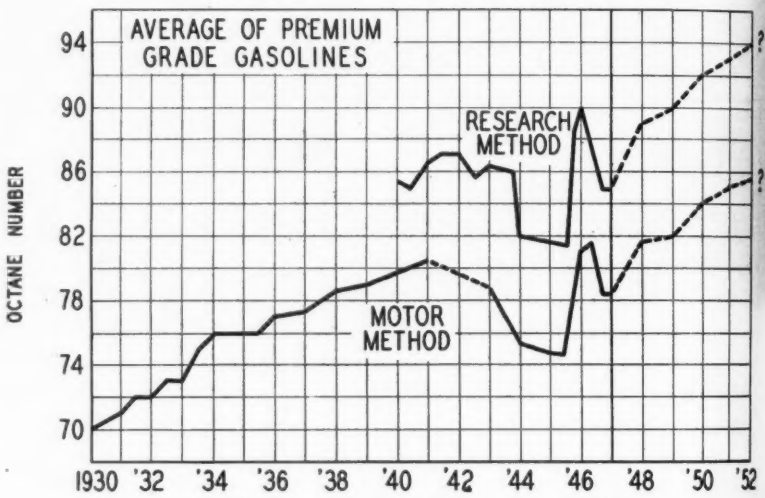


Fig. 9—Reid vapor pressures of average motor gasolines

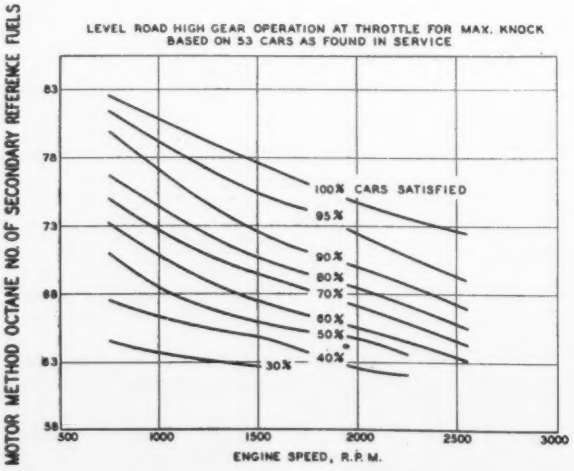


Fig. 8—Per cent cars giving trace knock or less as a function of octane number and engine speed

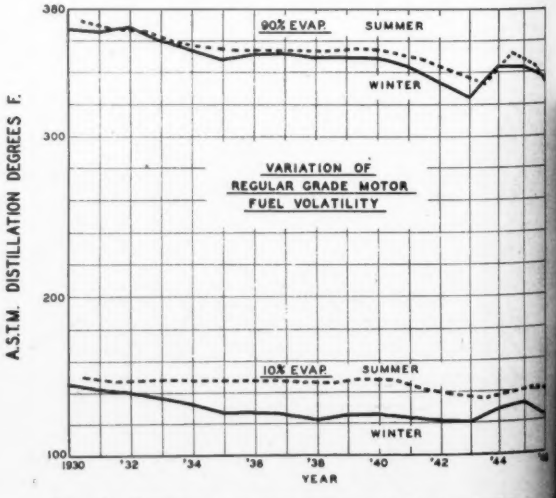
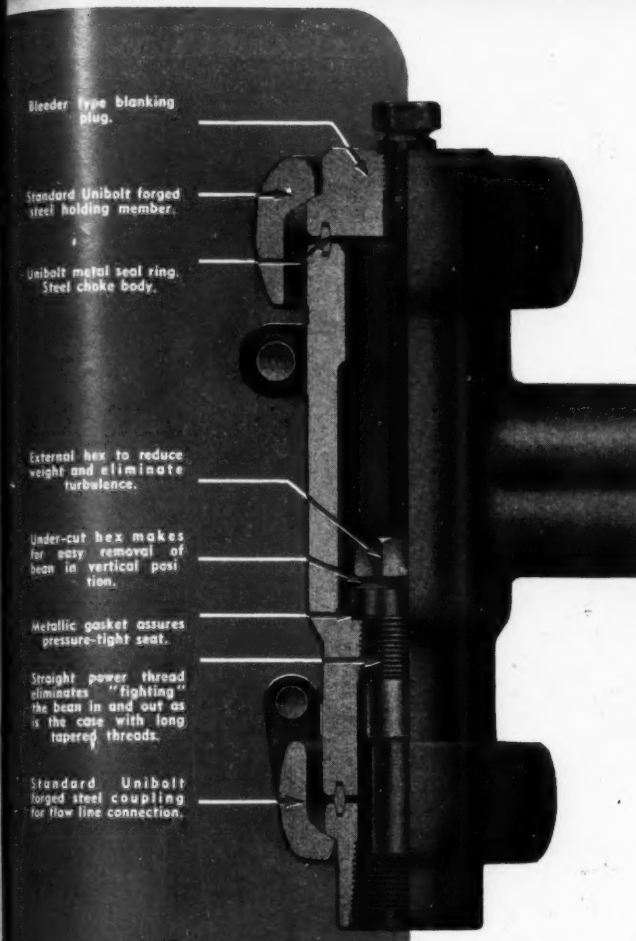


Fig. 10—Variation of regular-grade motor-fuel volatility


Bleeder type blanking plug.
Standard Unibolt forged steel holding member.
Unibolt metal seal ring. Steel choke body.
External hex to reduce weight and eliminate turbulence.
Under-cut hex makes for easy removal of bean in vertical position.
Metallic gasket assures pressure-tight seat.
Straight power thread eliminates "fighting" the bean in and out as is the case with long tapered threads.
Standard Unibolt forged steel coupling for flow line connection.

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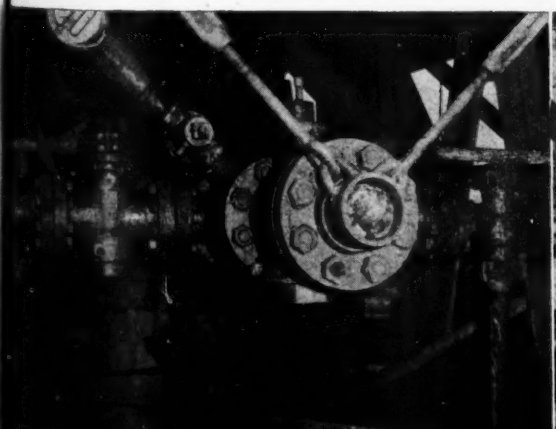
THE ONE BOLT COUPLING

A UNIBOLT Choke Body fitted with a UNIBOLT positive bean is your best bet for controlling high pressure well flow or the return of mud when it is necessary to close the preventers and bleed off well pressure through a flow line. Both flow conditions are often highly abrasive and it is in this service that UNIBOLT chokes have so often demonstrated their superiority.

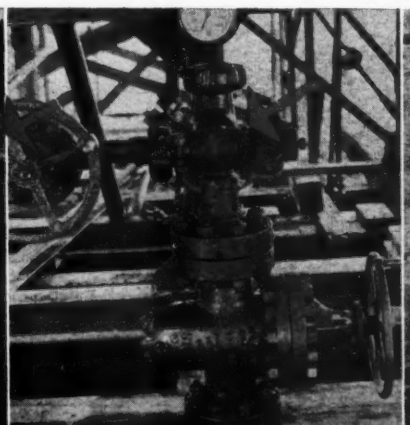
Replace the positive bean with a stem seat and insert a stem assembly in place of the blanking plug and you have a UNIBOLT Adjustable Wing Valve which many operators are now using in Christmas tree manifolds to provide a shut-off for changing chokes.

The UNIBOLT Choke Body is available flanged, as illustrated, in pressures up to 15,000 lbs. test, or with a threaded inlet in 6000 and 10,000 lbs. test pressure, tee or cross type. It will accommodate either UNIBOLT beams drilled in increments of 1/64" or "X" Beans drilled in increments of 10% of well flow. Both types of beans are drilled to extremely close tolerance and are heat-treated to produce minimum hardness of 60 Rockwell C. Hard chrome beans are available for extremely abrasive service.

THORNHILL-CRAVER COMPANY, INC. Houston, Texas



(1) Two UNIBOLT Choke Bodies fitted with positive beans assembled in a mud return choke manifold.



(2) A UNIBOLT Choke Body fitted with positive bean on an extremely high pressure well.

(3) A UNIBOLT Choke Body fitted with stem assembly being used as an Adjustable Wing Valve in a Christmas tree flow manifold.

PAINTED FOR JONES & LAUGHLIN STEEL CORPORATION BY ORISON MACPHERSON

TRANSPORT OF PETROLEUM TO SERVE YOU WOULD BE WASTEFUL, SLOW, COSTLY—WITHOUT STEEL

Without steel, the petroleum that serves you in so many ways would still come out of the fields in wooden barrels. Transport would depend upon wagons, or flatcars with big wooden tubs. It might have to resort again to artificial floods, such as were operated during the "Oil Excitement" in Pennsylvania to sweep loaded flatboats down Oil Creek into the Allegheny and on to Pittsburgh. Lives were lost, great quantities of priceless petroleum were wasted when flimsy craft were wrecked in this frenzied rush to markets.

With steel, petroleum and its products and natural gas are transported to distant markets swiftly, inexpensively and without waste in pipe line systems that criss-cross the country. Thousands of miles of them are line pipe manufactured by Jones & Laughlin Steel Corporation of Controlled Quality Steel. Other J&L steels are components of tank cars and trucks, tank ships and barges.

Tomorrow, steel and petroleum research will develop still stronger, tougher steels. With these the oil and gas industries will achieve still better transportation for their many products so vitally essential to our mechanized civilization.

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PIPE LINES

"Without the pipe line," says the story of 85 years of the oil business published in 1944 by the American Petroleum Institute, "oil literally would have backed up into the wells for lack of outlet, and the needs of modern civilization been left unsatisfied."

5 million barrels of crude oil are handled every day by pipe line systems in U. S.

A pipe line pousse-café is development of petroleum research, whereby 14 different petroleum products today may be transported at same time in same pipe line without mixing, as in making a pousse-café, gay 90's colorful tipple of liqueurs in layers of different specific gravities.

1st successful pipe line was laid in 1862 by Barrows & Co. to transport oil from Tarr Farm (Oil Creek) to nearby refinery.

"Pond freshets," (artificial floods) were operated in Oil Creek, before pipe lines were laid, to float boats to market loaded with oil in barrels and in bulk. Sawmill dams were opened, often twice a week, causing a quick rise in the stream. Waiting boatmen then cast off and went whirling down Oil Creek in their frail craft, watched by excited crowds. Jams often occurred. Boats were dashed to pieces against each other or bridge piers or dams. Men were drowned or crushed.

Entire cargo of a flatboat fleet of the 60's could be carried in one of today's 10,000-barrel steel petroleum barges operating on Ohio-Mississippi river system.

Disaster often hit oil fleets on voyage to Pittsburgh. An ice gorge in 1862 crashed into 350 boats with 60,000 barrels of oil aboard, crushing half of them, spilling the oil. Loss was over $350,000. Fire broke out in one fleet, which tore loose and bridged the Allegheny with flames. One barge drifted to Franklin, Pa., burned wooden bridge there.

6,000 teams were engaged in oil hauling along Oil Creek in 1860. In one day 2,000 wagons passed through Titusville, Pa.

Actual photos of "pond freshets" in action on Oil Creek, found by Dr. Paul H. Giddens, curator of Drake Well Memorial Park, Titusville, Pa., among families of old-timers in the oil fields, were loaned to artist Orison MacPherson for guidance in painting "Oil Transport" on opposite page.

For free print of "Oil Transport," write Publicity Manager, Jones & Laughlin Steel Corporation, Pittsburgh 30, Pa.

Tank trucks and cars of J&L Otiscoloy steel weigh less, carry more, last longer.

First "tank" cars were merely wooden flatcars equipped with 40-gal. wooden tubs.

For a free copy of J&L book, "Tubular Products for the Oil Industry," write nearest District Sales office listed at left, or Publicity Manager, Jones & Laughlin Steel Corporation, Pittsburgh 30, Pa.

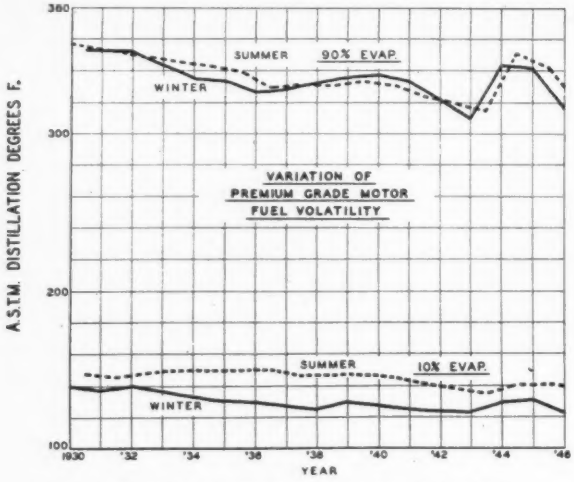

Fig. 11—Variation of premium grade motor fuel volatility

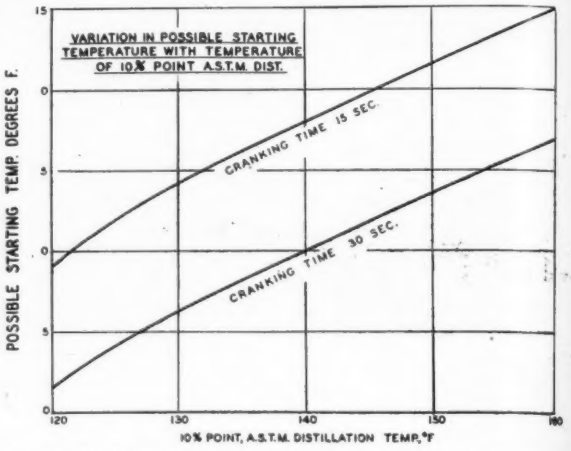
VARIATION IN POSSIBLE STARTING TEMPERATURE WITH TEMPERATURE OF 10% POINT A.S.T.M. DIST.
POSSIBLE STARTING TEMP. DEGREES F.
CRANKING TIME 15 SEC.
CRANKING TIME 30 SEC.
10% POINT, A.S.T.M. DISTILLATION TEMP. °F

Fig. 13—Variation in possible starting temperature with temperature of 10 per cent point A.S.T.M. distillation

per cent of our total motor gasoline or about 35 per cent of the cracked stock produced in 1946. Also shown on this chart for the year 1946 is the distribution of the catalytic stocks among the major catalytic processes and similarly the distribution of thermal stocks as produced by the principal thermal processes.

The motivating factor in the development and application of new refining equipment, at least through the middle thirties, was the increase in demand for light products, particularly gasoline. Fortunately, quality improvements by way of thermal cracking were obtained simultaneously with increased output at no cost directly attributable to quality increases. Subsequent to that time, capital outlay for processing equipment has been made not only to enhance the quantity of gasoline production but also the quality. This trend reached a peak during the war years when the installation of new refinery equipment was predicated almost entirely upon its ability to produce high-octane-number aviation gasolines. The majority of this equipment yielded high-quality products with no more degradation of crude oil than previously practiced in thermal cracking.

Gasoline Quality Trends: Motor-Fuel Antiknock Quality

Quality improvements in gasolines most eagerly sought by refiners in the immediate prewar and war years evolved almost exclusively around antiknock quality. Advancements in automotive-engine design requiring higher octane numbers, and competitive spirit on the part of gasoline producers were responsible for upward trends.

Figs. 6 and 7 show average antiknock qualities of regular and premium grades from 1930 to 1947, and predictions through 1952. Such predictions may be obtained from any of several sources for the asking; however, they are usually influenced to quite an extent by the business interests of the forecaster. At the same time it is recognized that a sound fundamental analysis cannot be made of the many factors which control antiknock quality levels, such as automotive design advances, general, economic trends, fluctuations in quantity supply and demand, and competitive considerations. For example, current economic conditions are such that the demand for gasoline is unprecedented. Estimates of requirements during the coming year are constantly being revised upward. At the moment, refining equipment

(Continued on page 126)

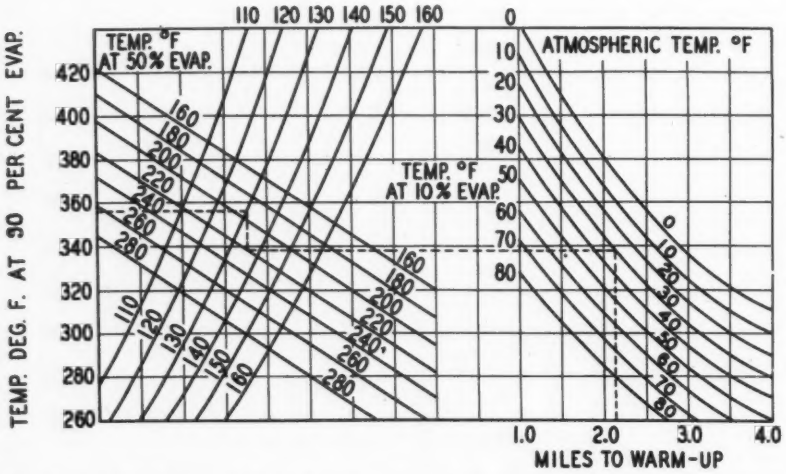

Fig. 12—Relation of A.S.T.M. distillation characteristics to vehicle warmup. (Directions: Draw line from 90 per cent point to 10 per cent point to 50 per cent point to atmospheric temperature to warmup miles)

TABLE 2—YIELD OCTANE RELATIONSHIPS FOR REFORMING 250°-400° F. OKLAHOMA CITY TYPE NAPHTHA

A—Thermal Reforming at 800 Psig. and 1,000° F.

Vol. per cent reformed gasoline*	100	90	80	70
(R.v.p.—10 psia.) (naphtha charge)				
Motor-method Oct. No.:				
Clear	36	60	68	72
+3 ml. TEL per gal.	..	75	81	83
1939 research Oct. No.:				
Clear	38	62	75	82
+3 ml. TEL per gal.	..	78	86	93

B—Polyforming (No Outside Gas) at 1,500 Psig. and 1,050° F.

Vol. per cent polyformed Gasoline*	100	90	80	70
(R.v.p.—10 psia.) (naphtha charge)				
Motor-method Oct. No.:				
Clear	36	68	74	78
+3 ml. TEL per gal.	..	80	83	84
1939 research Oct. No.:				
Clear	38	77	85	89
+3 ml. TEL per gal.	..	88	93	96

*Based on naphtha charge.

Position of Natural Gasoline and the N.G.A.A. in the Petroleum Industry

by J. H. Dunn

IF we exclude the three war years of 1943, 1944, and 1945, our experience has been that the average monthly low price of 26-70 natural gasoline on an annual basis has amounted to only 46 per cent of the average monthly high in each year. The maximum variation in that period resulted in the average monthly low price being less than 25 per cent of the average monthly high price. The year showing the most stable price was 1939 when the low price amounted to 59 per cent of the high. In 1946 the low price was only 55 per cent of the high price.

Far too many natural-gasoline plants outside of an integrated system have been cut adrift by the instability of the market for their products and forced prematurely into abandonment. But many more have never been built for the same reason. Real conservation requires that this situation be remedied, and it should be our hope that the future will bring competitive prices for our products on the basis of a steady flow into the over-all petroleum-products picture. Then and only then can it be expected that the independent natural-gasoline-plant operator will be able to finance his plant and by prudent operations secure his proper place in the industry.

Such a desirable result should be an objective of all concerned and would undoubtedly strengthen the backbone of the industry. The general situation in the industry has been greatly improved in recent years as a result of its having been able to get away from its one-product dilemma. Today we enjoy reasonably satisfactory markets for propane and butane as mixtures in L.P.G. and also in pure form. The demand for these products has developed rapidly on a basis which is independent of refinery requirements, thus bringing effective conservation through utilization of large supplies of products which previously enjoyed only a very limited demand.

The N.G.A.A.'s record of service to the industry deserves the commendation of all concerned. It seems proper at this time to review some of the association's accomplishments, purposes, and objectives. For those who may not know of some of the work under way in the N.G.A.A. committees, a few of the more important studies should be mentioned. One of these is the report of the Nowata road tests. This was a cooperative project of N.G.A.A. member companies under the direction of the technical committee. These tests indicate that more than 1,000,000 bbl. of butane can be added to winter motor fuels and still give trouble-free operation for all the present-day cars on the road. Certainly, no one in our industry would question the value of this type of research. Its benefits are obvious.

In his presidential address, presented here in abridged form, J. H. Dunn, president, Natural Gasoline Association of America, presented a discussion of the current economic condition of the natural-gasoline and cycling industries, and presented suggestions for meeting some of their problems. Dunn is president of Shamrock Oil & Gas Corp., Amarillo, Tex.

Another Road Test Series Planned

Another series of road tests, much more comprehensive in scope, now is being planned. It is hoped to start this in the fall and the work will probably extend over a period of at least 1 year. This series is concerned with the antiknock properties of fuels and the relative merits of straight-run types of fuels as compared with highly cracked stocks with respect to engine deposits, varnish, and sludge. We have reason to believe the paraffinic stocks will show to advantage in these tests. This is a big undertaking and will justify the cooperative effort of every interested party. It will take both money and manpower to carry to conclusion but the result may be the answer to the question, "Where do we go from here?" with both our light ends and the natural gasolines from which they may have been extracted.

From these tests is sure to come some valuable information on blends; information which must eventually result in finding for the industry the proper place for the utilization of its products in the over-all hydrocarbon balance. This will not only contribute to greater prosperity for the industry but substantially increase our contribution to the conservation of natural resources.

Another N.G.A.A. committee assignment of definite interest to every plant operator is the correlation of plant-control tests. The maintenance of plant operating efficiency can to some extent be shifted from technical engineers to other plant personnel. The use of frequently calibrated quick tests which can be performed by nontechnical plant men will make this possible. We know that there are many such tests now in use at plants and the first move has been to accumulate as much information as possible about them. This committee will correlate all existing information on such tests and will issue a report on some practical procedures which are in use in the industry.

Another N.G.A.A. committee activity is concerned with studies of improvements in the control of separation and synthesis processes which might result from broader use of infrared and ultraviolet spectrophotometry. Unquestionably these methods offer tremendous improvements over other common analytical techniques. They also offer some application to the automatic control of processes, particularly fractionation. Accordingly, the N.G.A.A. technical committee is undertaking a comprehensive study of all such tests with a view to recommending their use wherever they are proven practical and efficient.

There seems to be no question about the need in our industry for a good operators manual. Every company would like to have an authoritative publication of this kind to distribute throughout its organization. The value of such publications in vocational training and for reference purposes for field and plant men has been amply illustrated by the success of the American Petroleum Institute with the series of manuals

(Continued on page 125)

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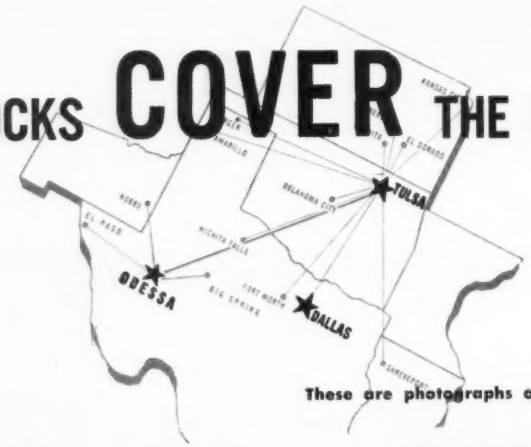
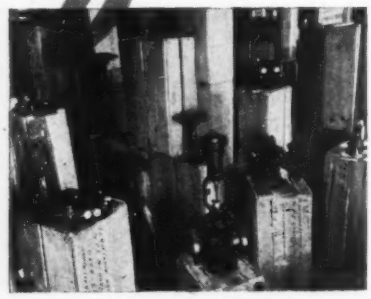


These are photographs of stocks in our various warehouses

for



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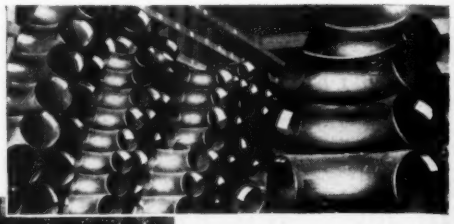

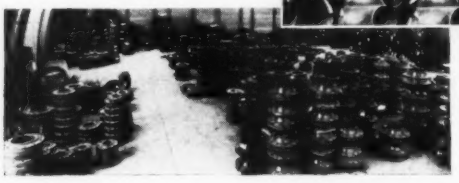

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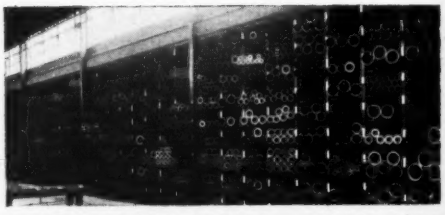

MECHANICAL TUBING
Stocks at Dallas

Supply Headquarters for the Refiner

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published under its sponsorship. The many changes which have come in recent years have made necessary a specialized and comprehensive version of the manual on modernized natural gasoline and cycling operations. The N.C.A.A. has begun the preparation of material for such a publication, and the separate chapters are being written by individual members of the technical committee. Each of these men is serving as the chairman of a subgroup made up of specialists chosen from the membership of the Natural Gasoline Supply Men's Association.

Another problem being investigated is concerned with high pressure absorption in the range between 500 and 3,000 psi. While this would seem to be more interesting to the cycling operator, it will also have useful application in connection with the design and operation of some of the modern natural gasoline plants. Here again the project begins with the collection and correlation of all existing information with a view to establishing reasonably accurate empirical data for operational guidance in the industry.

Other N.G.A.A. Contributions

In the field of liquefied petroleum gases the technical committee is reviewing all present specifications and test methods. An effort is being made to find practical methods for determining the character and percentage of various sulfur compounds in these gases. These methods are not expected to replace the present N.G.A.A. total sulfur methods but rather to supplement it. Some thought is also being given to the publication of specifications and test methods for pure hydrocarbons. This would include yardsticks of quality for such products as pure propane, butane, isobutane, and isopentane.

During the past year we have submitted to the American Society for Testing Materials three N.G.A.A. standards for their consideration for the adoption as A.S.T.M. standards. The standards submitted were the association's L.P.G. specifications and test methods, the hydrometer method for determining the specific gravity of liquefied petroleum gases and the L.P.G. volume-correction factors. The first two are now before a newly created A.S.T.M. group known as Technical Committee H on light hydrocarbons, a subgroup of Committee D-2 on petroleum products. The third is in the hands of Section XV of Committee D-2. The N.G.A.A. has direct representation on all these groups and follows their discussions closely.

It would be difficult to overestimate the value of the cycling industry of N.G.A.A. studies of high-pressure gas operations. The N.G.A.A. corrosion research project is a cooperative one, in which a number of nonmember companies also participate. It is one of the most valuable undertakings of recent years. In the course of the 3 operating years, these studies have progressively yielded information which has had immediate valuable application in operating practices. The N.G.A.A., being a service organization, is glad to sponsor these cooperative projects. The association has frequently had the financial support of nonmember companies in these projects, because of the general interest of the industry in solving these vitally important operating problems.

Other important N.G.A.A. studies of high-pressure gases are being carried on by the high-pressure gas-sampling committee. Following several years of cooperative field testing, this committee is ready to begin correlating results obtained by the various individual companies during the past year with the data developed in the field tests. Primary objective of this work is to formulate recommended procedures for obtaining representative samples of two-phase, high-pressure gas streams and a tentative method for determining the specific gravity of such gases.

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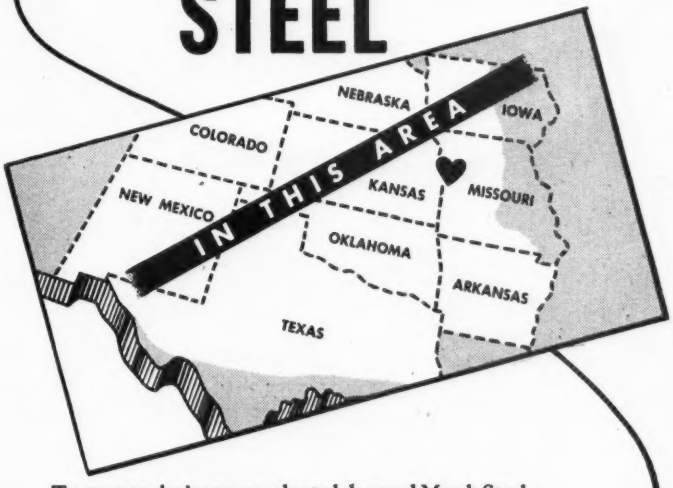

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Combustion-Engine Fuels

(Continued from page 120)

is operating close to maximum capacity and crude production lags behind runs to stills. Such conditions are not conducive to antiknock quality increases.

With these reservations, the prediction indicates an increase in over-all quality in the next 5 years roughly equal to that which took place in the 5 prewar years. The equivalent increase in the two periods does not, of course, represent equal effort on the part of the fuel producer since advances in the higher range are more difficult and more costly to obtain in terms of equipment and raw materials. Thus, the increases in A.S.T.M. (motor method) octane numbers from 81 to 86 in premium grade, and from 76 to 79 in regular grade in the postwar period to 1952 actually represent more in the way of refining equipment or cost, or both, than similar over-all increment in the immediate prewar years.

TABLE 3—OCTANE NUMBER CHARACTERISTICS OF MOTOR GASOLINE FRACTIONS FROM CATALYTIC CRACKING

A—Cut points of fractions, °F., from paraffinic charge stock

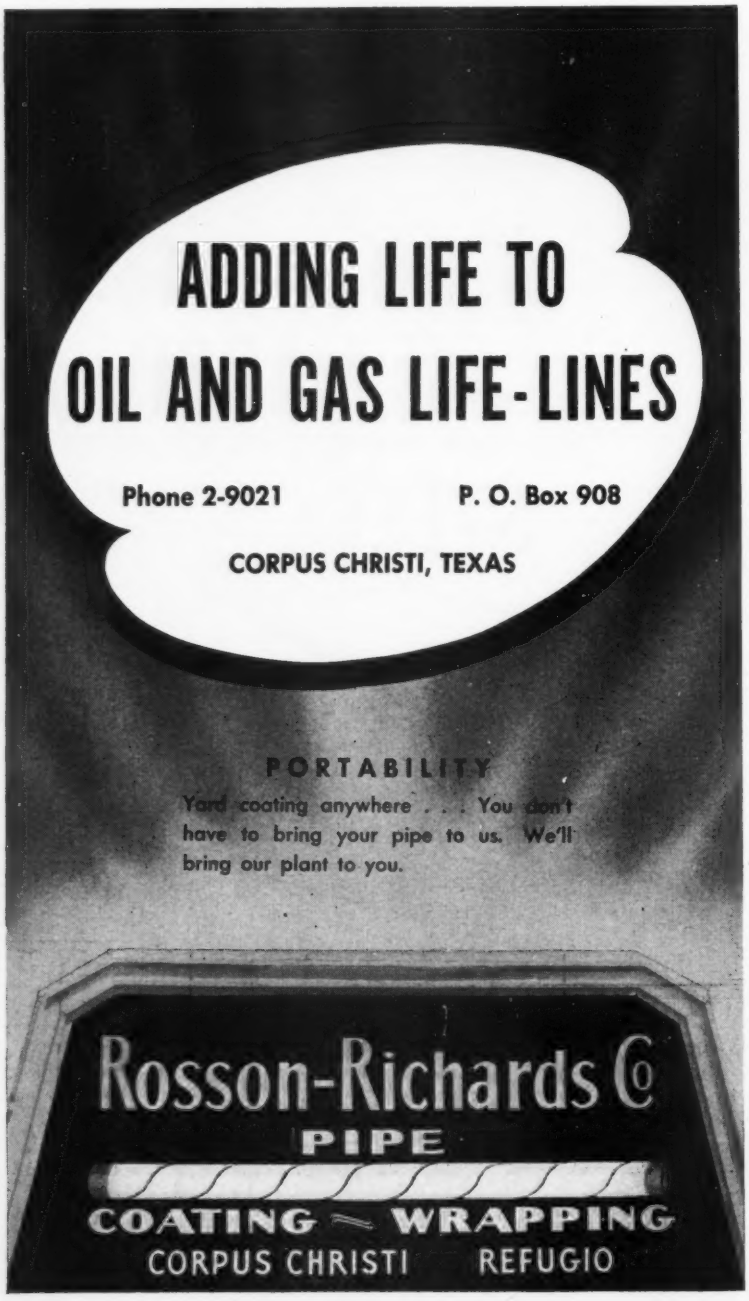
Motor method octane number:	78-104	104-158	158-212	212-257	257-300	300-356	356-400
Clear	83½	79½	74	74	76	78	75
+ 3 ml. TEL/gal.	99	93	87	86½	86½	86½	84

B—Cut points of fractions, °F., from naphthenic charge stock

Motor method octane number:	78-104	104-158	158-212	212-257	257-300	300-356	356-400
Clear	86	79½	77	74½	81	87	83
+ 3 ml. TEL/gal.	>100	93½	89	88½	91	94	91

It is anticipated that the research-method octane number should increase somewhat more rapidly than the motor-method octane number as a result of more drastic cracking operations. This type of processing increases aromatic and olefin content of the finished fuel making it less knock sensitive to the lower operating temperatures of the research-method procedure. From the antiknock-quality standpoint, engine designers should embrace all possible means of establishing engine design and operating variables which take advantage of the higher potential octane number quality—as indicated by research-method octane ratings—that may be obtained from gasolines of today and tomorrow.

The estimates of antiknock quality trends assign the major improvement to the premium grade in which the improvement was less spectacular in the late thirties and early forties. It is believed that the logic of this may be gleaned from Fig. 8, a chart showing a relationship between octane number and the per cent of cars satisfied at various engine speeds. If, as generally believed, the critical low-speed road-octane number of a fuel is somewhat above its motor-method rating but below the research, the prelead restriction average regular grade fuel would satisfy nearly 90 per cent of the cars on the road. Fuel requirements of all cars currently in production—and, from some reports, those that will be produced over the next year and a half—do not differ materially from those produced during the past 6 years which are well represented in the data constituting Fig. 8. Therefore, 10 per cent of the cars on the road, and, in addition, those which are designed and produced over the next few years utilizing higher compression ratios, will require the premium-grade fuel. The object of several major manufacturers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of higher priced cars appears to be to utilize higher compression ratios and thereby require fuels with motor-method and research-method ratings in the range of 85 and 95, respectively.

The likelihood of octane-number levels increasing beyond this point is questionable both on the basis of automotive-engine-performance data and on the revolution in refinery operations that would have to occur to make appreciable quantities of fuel of substantially higher antiknock quality. One estimate would indicate that no more than 100,000 bbl. per day of 100-octane-number motor gasoline could be produced while simultaneously manufacturing aviation gasoline to meet requirements and a regular grade in the range of 78-octane number. This would be only slightly more than 5 per cent of the total motor fuel production. On the basis of technical data made available by the automotive industry to date, there would appear to be little economic justification for antiknock quality going appreciably above the 85-95 (motor method, research method) octane-number level. At the same time, with existing refining processes, diminishing returns on a volume basis result when the emphasis is placed on high antiknock quality. For purposes of illustration, the data in Table 2 are presented showing the yield-octane number data for thermal reforming and polyforming operation on a 250°-400° F. Oklahoma City type naphtha. This represents the kind of material that will have to be upgraded in this manner to produce higher-octane-number gasolines. The yields shown are based on the naphtha charge and were calculated assuming production of a 10-lb. R.v.p. finished gasoline. As may be seen, the initial reduction in volume of 10 per cent results in a 24 to 39 unit increase in clear octane number. The subsequent reductions in yield of from 10 to 20 per cent for octane number increases in the range of 7 to 10 units are quite striking.

There exist only two practical routes to higher octane number without loss in yield; first, the use of increased tetraethyl lead, and second, the replacement of thermal cracking facilities with catalytic cracking equipment. With the trend toward higher-octane-number levels, it is concluded that both these routes will be followed, together with an increased recourse to naphtha reforming processes, particularly polyforming and hydroforming, even at the expense of yield.

Motor Fuel Volatility

Fig. 9 shows the trend in Reid vapor pressure for summer and winter gasolines during the past 10 years. In general there is little difference

TABLE 4—ESTIMATED CHARACTERISTICS OF FUTURE DIESEL FUELS

	Light premium diesel fuel	Premium diesel fuel	Regular diesel fuel	Economy diesel fuel
Gravity, °A.P.I.	40-44	33-41	30-38	22-34
Flash point, °F.	125-160	140-220	140-180	160-210
A.S.T.M. distillation, °F.:				
Initial boiling point	330-390	350-460	320-400	360-460
10 per cent recovered	370-420	420-510	400-440	440-500
50 per cent recovered	420-460	465-530	450-500	490-560
90 per cent recovered	460-520	575-650	560-650	590-680
End point	500-570	625-700	600-700	650-730
Sulfur, weight per cent	0.1-0.5	0.1-0.8	0.3-1.3	0.3-2.0
Viscosity, S.S.U. at 100° F.	31-33	33-37	33-38	37-41
Cetane number	45-50	45-50	36-42	25-40
Availability	Most localities	Few localities	All localities	Few localities

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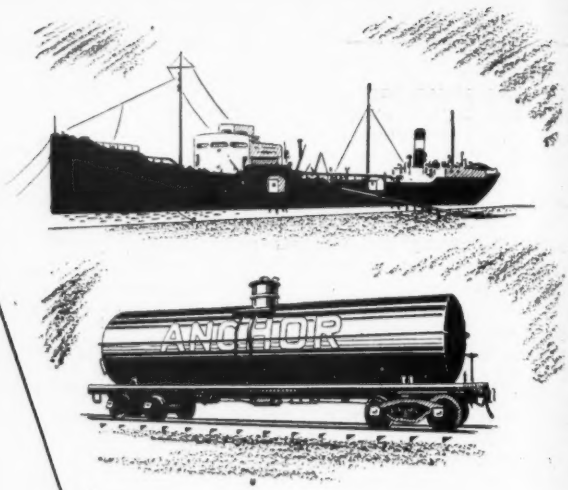

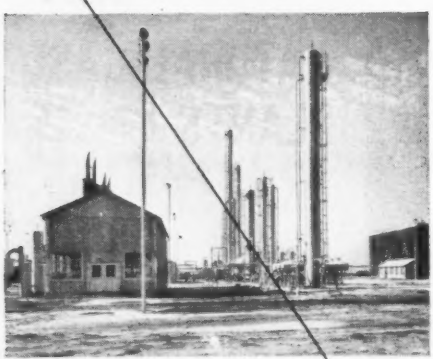

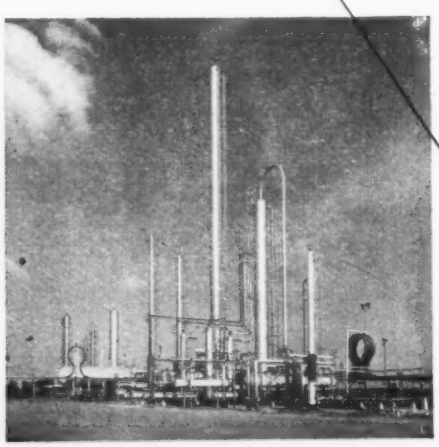

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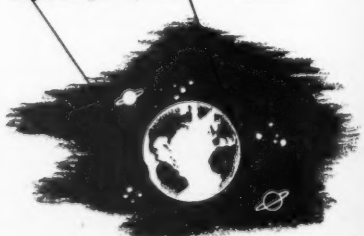

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between regular and premium grades. Seasonal differences average about 2½ lb., with greater differences in gasolines marketed in northern areas, and smaller ones in gasolines marketed on the Pacific Coast and in the southern areas. A general upward trend in vapor pressure may be noted during the prewar years with a rather sharp drop during the war. This decrease was dictated by the utilization of lighter fractions, particularly butanes, in the manufacture of aviation gasoline and synthetic rubber.

From the automotive-equipment standpoint, vapor pressures may be expected to resume their gradually increasing trend of the prewar years. This is accountable to improvements in car design involving larger fuel pumps and the location of fuel lines away from hot engine surfaces, which have reduced vapor-locking tendencies. Of course, no abrupt increases in allowable vapor pressure can be anticipated since many cars of older design will continue in operation and would vapor lock on higher-vapor-pressure gasolines.

Excess Butanes

Heavier thermal cracking and deeper reforming for octane-number improvement will result in the production of more butanes which will be substantially in excess of requirements to meet vapor pressure specifications. From the materials-conservation standpoint, if not to supplement antiknock-quality improvement, it would appear that more polymerization of butylenes and propylenes must be practiced. These same gases may also be partially converted to liquid products by polyforming operations.

Fig. 10 and Fig. 11 indicate the trend in 10 per cent and 90 per cent A.S.T.M. distillation temperatures over the past 10 years for regular grade and premium grade gasolines, respectively. Both 10 per cent and 90 per cent points show slight but definite reductions during the prewar years. This coincides with antiknock-quality increases, indicating the tendency to discard the heavier, less-volatile fractions of straightrun and thermally cracked gasoline which are much lower in octane number than the lighter fractions. There is additional evidence of this practice in the lower 90 per cent distillation temperatures for the higher octane number premium grade gasolines.

With about 20 per cent of the total gasoline production now consisting of catalytically cracked components, it may be anticipated that this downward trend in 90 per cent A.S.T.M. distillation temperatures will reverse. It has been amply demonstrated that the heavier fractions of catalytically cracked gasolines are high in antiknock quality. Table 3 presents data supporting this statement, showing

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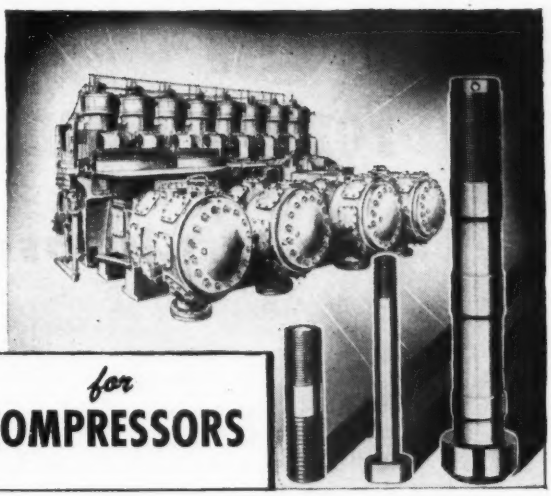

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the clear and leaded motor-method octane numbers of six fractions from each of two catalytically cracked motor gasolines. Using paraffinic charge stocks, octane numbers in the range of 75 to 80 can be maintained in the 300° to 400° F. boiling-range fraction. On the particular naphthenic charge stocks used in the illustration, octane numbers in the 300° to 400° F. ranges are substantially higher than those in the intermediate range, averaging 85.

The significance of this reversion to higher 90 per cent point fuels with regard to motor vehicle performance has been evaluated quite carefully and it is recognized that variation in fuel 90 per cent point is related to engine warmup. This relationship is shown in Fig. 12, which is a nomograph for evaluating fuel warmup quality from a knowledge of the 10, 50, and 90 per cent distillation temperatures. The procedure in using this chart is to draw from the 90 per cent point to the 10 per cent point, from this intersection to the 50 per cent point, from this point horizontally to the atmospheric temperature lines and thence to the miles to warmup. The value obtained in this fashion is the average of individual values obtained in a variety of passenger cars by an arbitrary but critical test procedure. The miles-to-warmup value obtained from the nomograph is appreciably higher than the miles driven by the average motorist before he considers his engine "warmed up." Since 75 per cent of the cars on the road at the present time are not fitted with automatic chokes, these data were derived from cars having manually operated chokes. Automatic chokes, when properly adjusted, do substantially reduce, if not nearly eliminate, the warmup period.

It is apparent from this chart that constant warmup quality can be achieved in fuels differing widely in 90 per cent point by appropriate modifications in the 10 or 50 per cent point temperature. Quantitatively, an increase in the 90 per cent point temperature of 10° F. can be compensated by a reduction of 3° F. in the 10 per cent point temperature or alternately by a 4° F. reduction in the 50 per cent point temperature.

Source of Data

The data on which the foregoing correlation is based have been obtained over a period of years by road tests and chassis dynamometer cold room tests. Supplementing this test work, employe-owned and operated cars have been used to establish, among other things, consumer reaction to fuels of varying warmup quality. One such program—conducted in the vicinity of Paulsboro, N. J., during the summer of 1946—utilized fuels having 90 per cent points as high as 420° F. The least

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70	175	(75 lbs.)	100	100	(43 lbs.)

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volatile of these fuels, had in addition to a 420° F. 90 per cent point, a 50 per cent point of 285° F. This fuel—used in six vehicles for 4,000 to 7,000 miles over a period of 3 months—had no detrimental effect on engine lubrication or on engine cleanliness. However, from the standpoint of consumer reaction based on warmup performance, the fuel was quite unsatisfactory.

The contribution of reduced 10 per cent point temperatures is shown in Fig. 13. Here is illustrated the relation between possible starting temperature and the fuel 10 per cent point. It reveals that a reduction of 10° F. in the 10 per cent point lowers the possible starting temperature by about 4° F.

The relation between fuel volatility and engine performance is a subject worthy of further study by both the petroleum refiner and the engine designer. While the relation of volatility to warmup and starting has been mentioned, we know that fuel economy and the tendency to detonation are also related to this characteristic.

Aviation Fuels

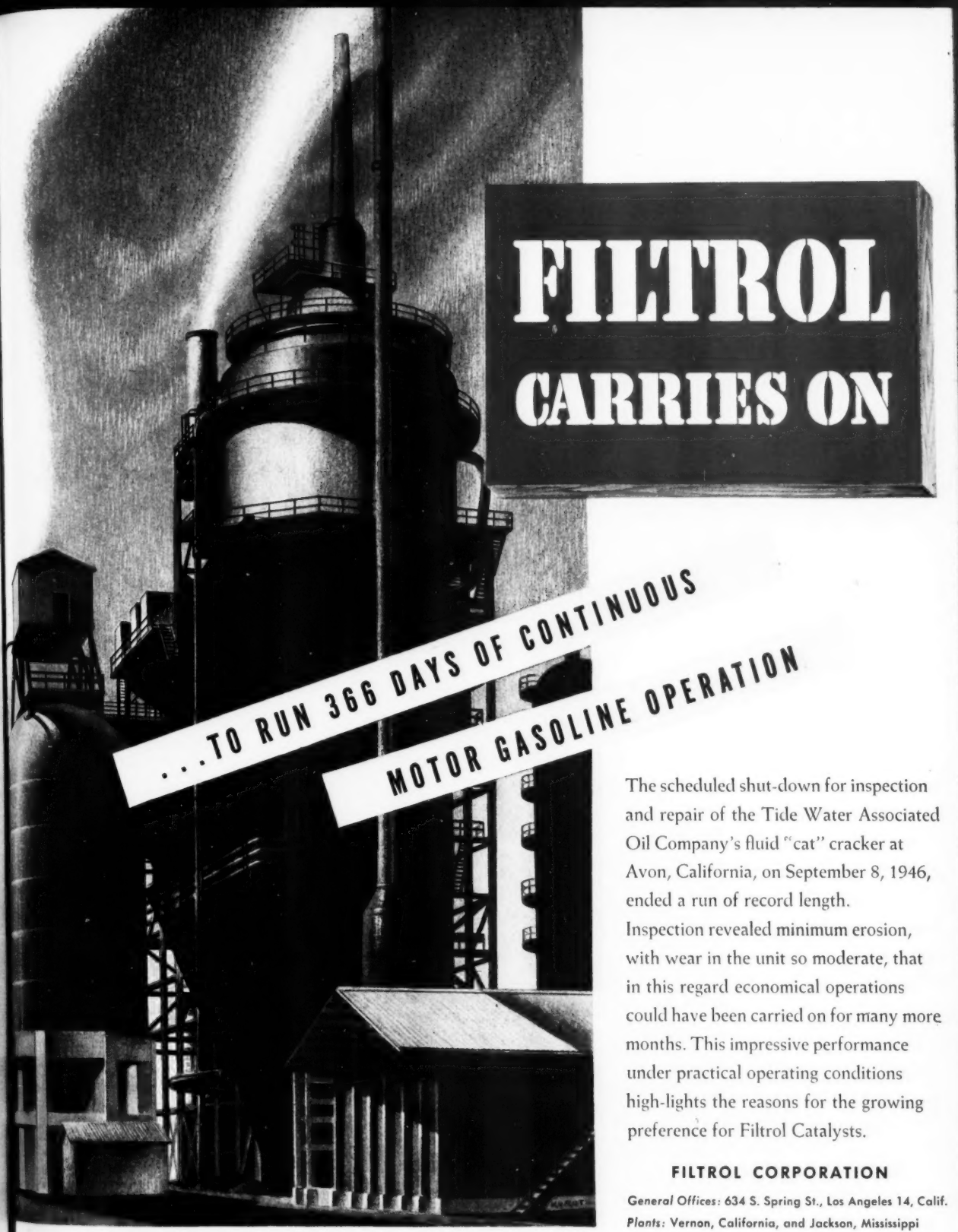
Relatively little needs to be said on the subject of aviation fuels.

Private-aircraft requirements for some time to come will be fulfilled by unleaded 80 octane number gasoline which is now available in most sections of the country. In time, private-aircraft engines and fuel systems may be designed to permit operation on motor gasoline as a steady diet. However, this change will probably not come about until the sales of private aircraft are sufficient to pay for the necessary engineering changes.

Diesel Fuels

While the demand for diesel fuels is growing rapidly, consumption is still a relatively small portion of the total distillate-fuel-oil market. It is estimated for the year 1948 that only 17 per cent of the distillate-fuel production will be consumed in diesel engines. Further, probably less than 25 per cent of this quantity will be considered as high quality; that is, 42 cetane number or higher. Recognizing this relation between diesel fuel and distillate fuel for heating purposes, it is apparent that diesel-fuel supplies will generally be drawn from heating-oil stocks. Otherwise there must be sufficient economic justification in the use of higher ignition quality to warrant special stock segregation and distribution facilities and possibly additional refinery processing such as solvent extraction.

Table 4 lists estimated characteristics of future diesel fuels and their anticipated availability. The discussion which follows on the processing aspects of domestic heating fuels applies generally to diesel fuels.



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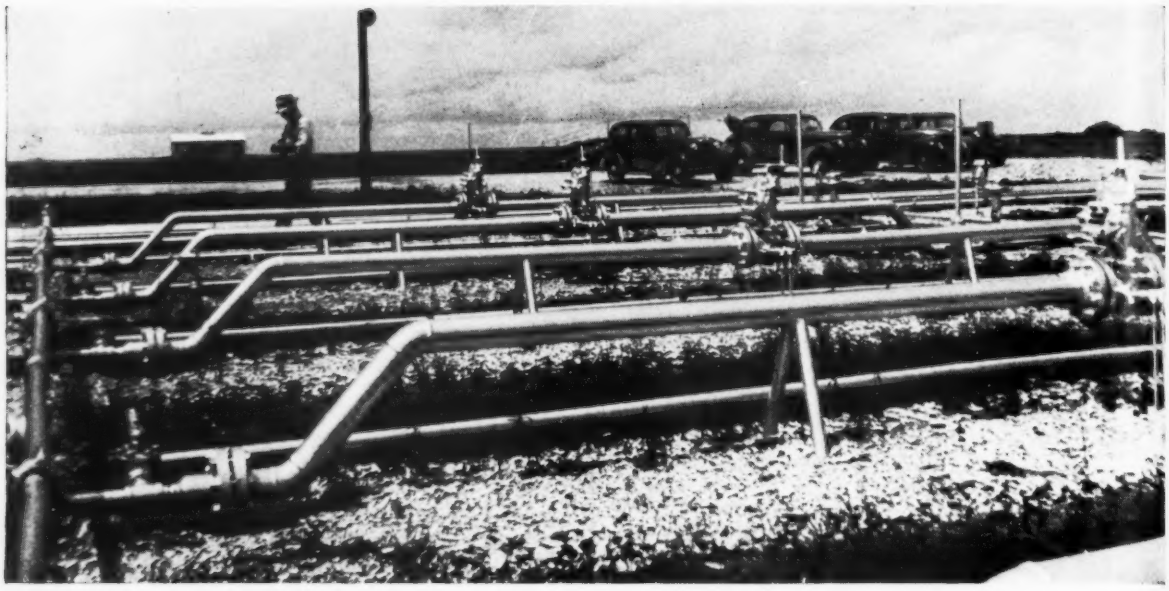

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(Continued from page 111)

was maintained at the pressure corresponding to the primary field separator pressure. In this manner the future field gas-oil ratio behavior could be determined directly. During each run the liquid flow from the bottoms of both the accumulator and the F-4 tower were each flowed through the F-5 tower for a part of the run so that samples and gas-oil ratios could be obtained. During the time one stream was charged through F-5 the other was vented. Flow through the unit during these early tests was regulated manually by means of needle valve N-1 because, at that time, connections which permit the use of FC-1 had not been made. Results obtained in this series of tests are summarized in Figs. 3, 4, 5, and 6.

Fig. 3 presents the relationship of liquid precipitation (total liquid and the hexane-plus fraction) with pressure decline in terms of the gas which remains in contact with or is produced from the reservoir where it was in contact with the precipitated liquid. The amount of liquid condensation corresponding to any reservoir pressure level can be obtained by integrating the curves of Fig. 3 with production over the interval from original pressure to the chosen pressure.

The curves of Fig. 4 represent the percentages of butane-plus and hexane-plus fractions from the original reservoir fluid which will have condensed at various reservoir pressures. These results were calculated from data on (1) the original reservoir fluid composition, (2) composition and properties of the condensate obtained at each pressure and (3) ratio of condensate to well stream charged at each pressure level. The curves of Fig. 5 show the variation in composition of the liquid which condenses at the different pressure levels. The curves in Figs. 3, 4, and 5 show variations only for total liquid, hexanes-plus, and butanes-plus materials, but variations in all other components can be determined from the analytical data.

In addition to these data regarding the material which condenses in the reservoir, an equally important and useful quantity, g.p.m. of the well-stream production, can be obtained from the quantities and compositions of the materials leaving the F-4 separator. Samples of both the liquid and the gas from this unit were obtained at each pressure. Fig. 6 presents the g.p.m. decline history as obtained in this manner. These results are in agreement with those recorded in

TABLE 2—COMPOSITION OF SEPARATOR PRODUCTS AND WELL STREAM FLUID

	670 psig. Separator gas		670 psig. Separator liquid		Well stream	
	Mol %	Mols	Mol %	Mols	Mol %	Mols
C_1–	18.46	4.111	1.90	0.055	16.56	4.166
C_1	67.73	15.083	10.83	0.312	61.22	15.395
C_2	7.59	1.690	7.65	0.220	7.60	1.910
C_3	3.25	0.724	9.84	0.283	4.00	1.007
iC_4	0.98	0.218	4.53	0.130	1.39	0.348
nC_4	0.99	0.220	9.73	0.280	1.99	0.500
iC_5	0.39	0.087	2.05	0.059	0.58	0.146
nC_5	0.25	0.056	4.62	0.133	0.74	0.189
C_6	0.23	0.051	10.07	0.290	1.35	0.341
C_{7+}	0.13	0.029	38.78	1.117	4.57	1.146
Total	100.00	22.269	100.00	2.879	100.00	25.148
Mol wt. C_{7+}	103	.....	*131	.....	.....	.....
Sp. gr. at 60° F.	.....	.....	0.7766	.....	.....	.....

*Experimentally determined. G.O.R. = 10,460 S.g.f./bbl. Barrel separator liquid/stock tank oil = 1.238.

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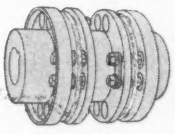
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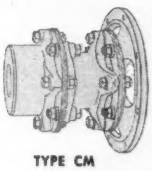
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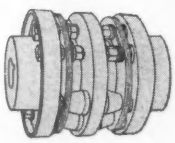
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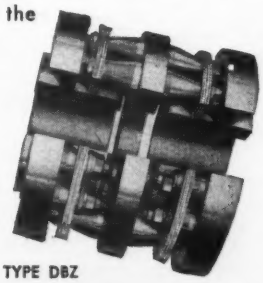
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Figs. 3 and 4 in that they indicate a relatively rapid decline in g.p.m. with pressure decline to about 2,500 psi., with a gradual leveling off at about 1,500 psi. and with a slight increase at pressures below 1,000 psi.

Results as shown in Figs. 3, 4, 5, and 6 provide data which are necessary in order to evaluate the advantages and economics of future operations and to justify cycling plant installations. Data of this nature can be obtained in the laboratory on a static system, but in many cases, it is open to considerable question because the quantities of sample involved are not sufficient to permit complete analytical study of the streams and because, in many cases, it will be necessary to replace a well stream component, for example H_2S and CO_2, with some hydrocarbon.

Determination of Phase Condition of Reservoir Material

Studies in a second field were made early in the field life and with a two-fold objective:

1. To determine the phase condition of the initial reservoir material—whether all gas or both liquid and gas.
2. To obtain data on condensation of liquid in the reservoir with pressure decline.

The first studies made in this field consisted of five runs, three of which were to answer objective No. 1 above. One run had to be discarded because of the excessively high sampling rate used. Extensive gas-oil-ratio data were obtained both on the field production and the mobile unit in order to arrive at the proper sampling rate for the operating conditions. Well production was relatively constant at about 1.3 million cubic feet per day with an average gas-oil ratio of 13,800 cu. ft. per barrel. Well-head flowing pressure was well above 4,000 psi. A sampling rate of slightly less than 300 cu. ft. per hour with a 9/64-in. tip was used part of the time, and a rate of about 475 cu. ft. per hour with a 13/64-in. tip was used for the remaining runs.

After the proper sampling conditions had been determined, runs were made in which the samples were recompressed to (1) original reservoir pressure, (2) 120 psi. below original pressure, and (3) 550 psi. below original pressure, respectively. In each case the recompressed sample was charged to the accumulator at reservoir temperature. In the first two runs cited no liquid accumulation occurred. In the third run liquid condensation was noted in the accumulator.

A final run was made in which the well-stream sample bypassed the compressor and was flashed in the E-1 tower at 4,000 psi. and line temperature (106° F.). Retrograde condensate from the 4,000-psi. vapors was collected in F-3. The results indicated a gas to stabilized 4,000-psi. separator liquid ratio of 19,800 cu. ft. per barrel and a ratio of 48,600 cu. ft. of gas per barrel of liquid condensed from 4,000-psi. gas. This corresponds to condensation of 71 per cent of the recovered liquid at 4,000 psi. and 106° F.

The results obtained in this work indicate definitely that the material entering the well bore is in a single vapor phase and that its dew point is more than 120 psi. but less than 550 psi. below the initial pressure.

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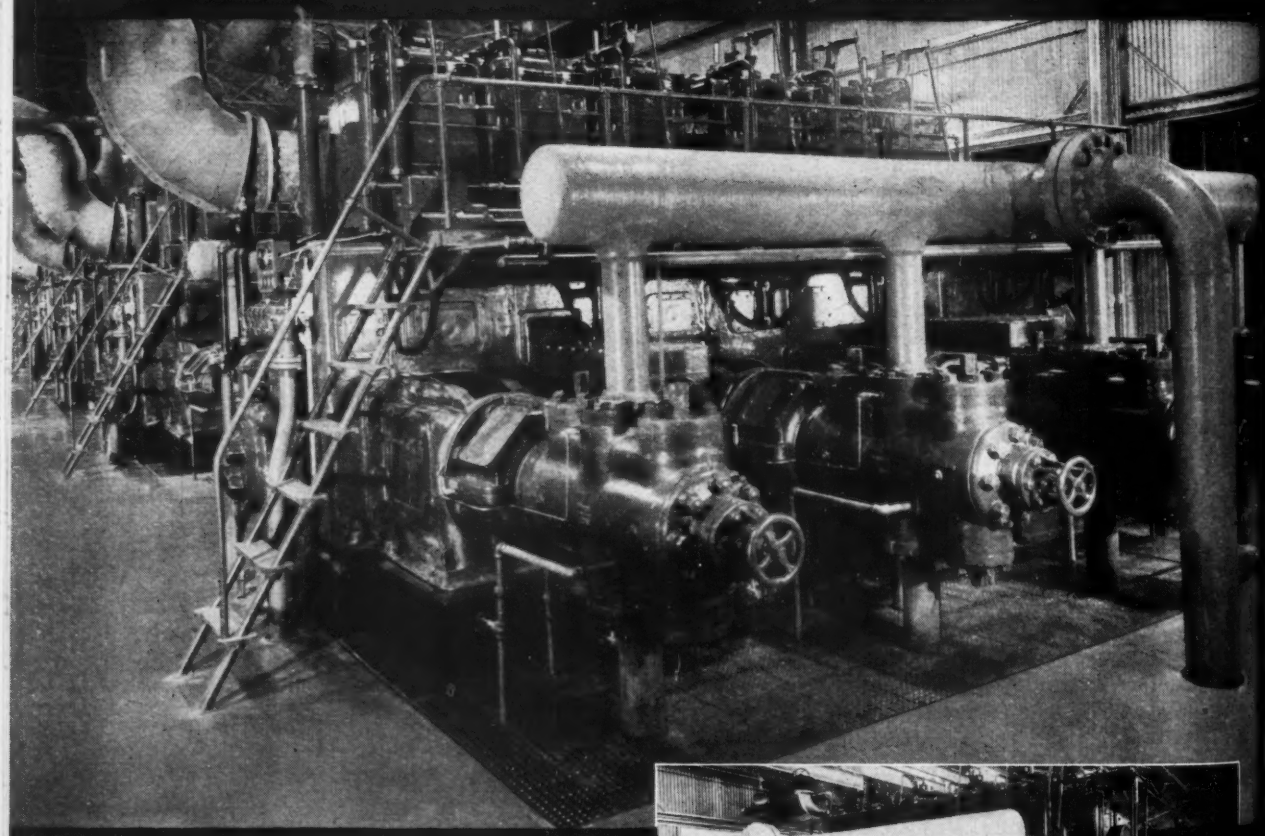

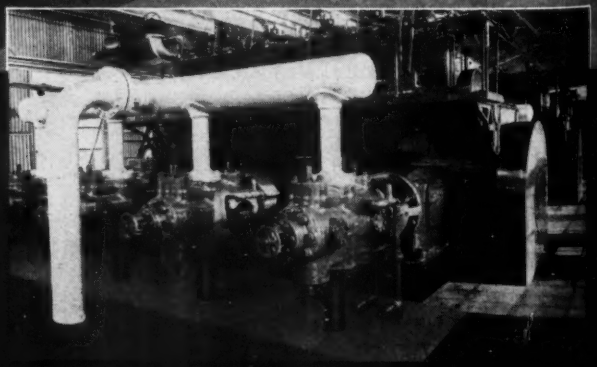

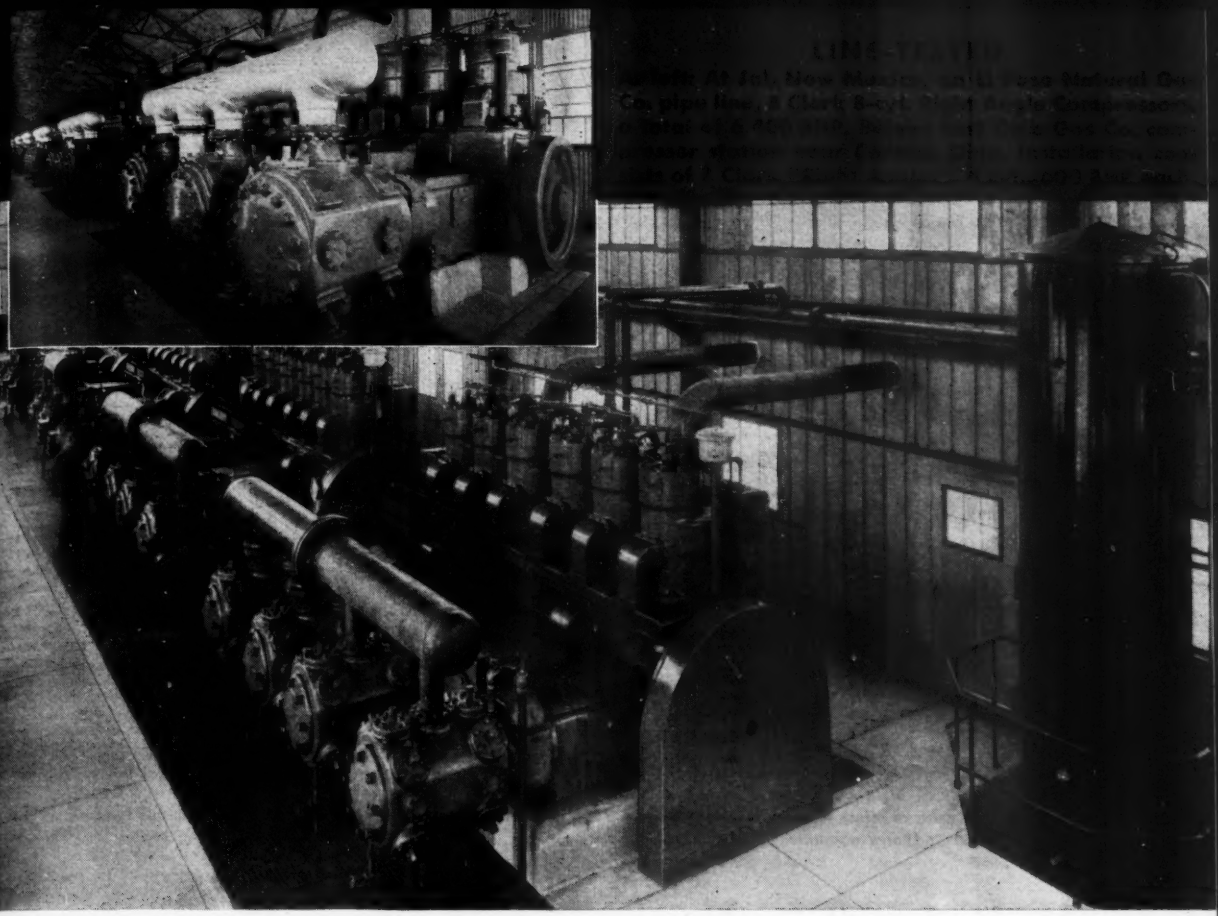

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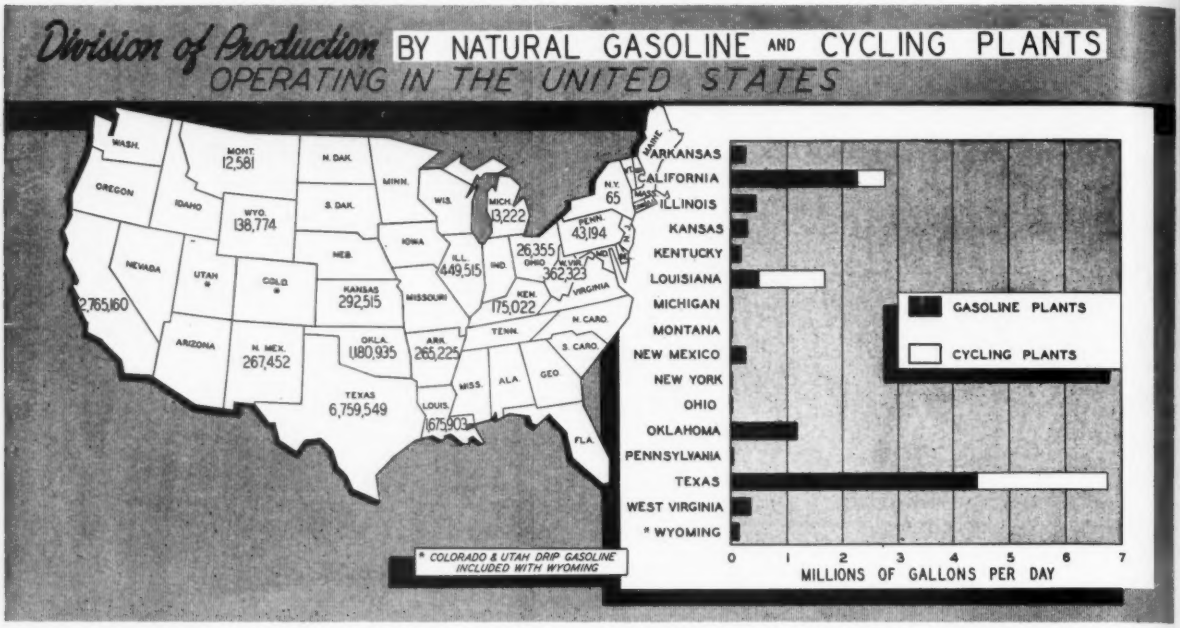


Based on the latest Bureau of Mines reports covering January 1927 production from natural-gasoline and cycling-plant operations, the bar-graph shows quantities in millions of gallons whereas those given on the map are in unit gallons

Natural-Gasoline and Cycling Industry Operating at 91 Per Cent of Capacity

by R. B. Tuttle

EVEN with many of the factors which are adverse to efficient operation still present in 1947, the natural-gasoline industry appears to be headed for efficiency improvements exceeding those of the past several years. Figures on natural-gasoline and cycling-plant capacity ratings compiled from reports on The Oil and Gas Journal's nation-wide survey of the industry show that the rated capacity of active plants in the United States totals 15,565,810 gal. per day as of April 1 of this year. The Bureau of Mines reports for January 1947 show a total production of 14,428,211 gal. per day. Based on these two figures the natural-gasoline and cycling industry is operating at 91 per cent of capacity, an exceptionally high average figure.

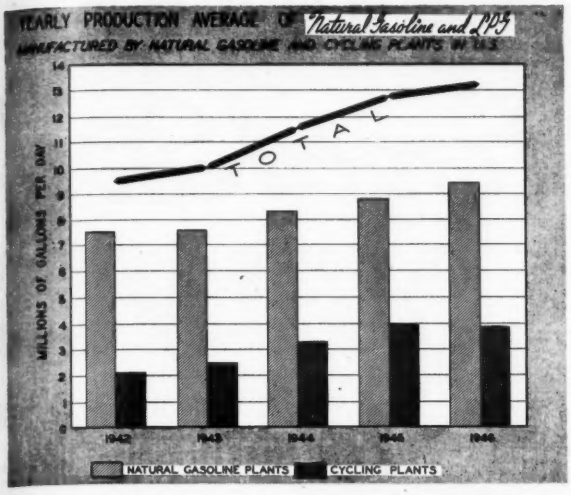
Based on the projection of a demand curve, constructed from data given in The Oil and Gas Journal, December 28, 1946, page 148, operations generally in the industry are indicated at 100 per cent of total plant rated capacity by early summer. In the event no new plants are placed in operation by late summer indications are that production will run to 105 per cent or more of ratings for currently operating plants. These projections when modified by the factors which effected a dip in the production curve for the past year show a peak efficiency for 1947 well above that for 1946. Since one of these major factors, that of adequate storage for L.P.G. products, is being reduced to a large degree below its 1945-1946 value, its effect on the curve projection seems negligible.

The important influence on the direction of the curve through 1947 appears to be transportation. Reliable reports on the completion of product lines show that this type of transportation will reduce the factor appreciably in the near future. The effect of this reduction in the transportation factor on the projection for 1947 gives a pronounced upswing to the curve when local distribution is not taken into account. The projection which indicates an operating efficiency of 105 per cent or more during the coming season is based on completion, later this year, of some of the product lines which will serve currently operating natural-gasoline and cycling plants.

Process-design trends, indicated by the newer plants constructed within the past year, point toward closer control of product limits than employed heretofore. Equipment specifications on many of the plants now under construction and in the drawing-board stage emphasize the industry's intention to maintain high operating efficiencies. Where conditions justify current process designs appear to be worked out to allow for broader operating flexibility.

Liquefied Petroleum Gas

With adequate distribution facilities available for meeting peak demands on L.P.G. products later in the

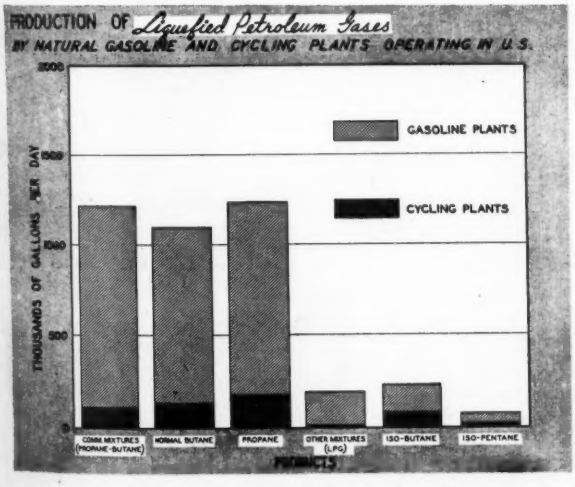


Daily production averages for natural gasoline and liquefied petroleum gas for the 5-year period from 1942 through 1946. Values based on Bureau of Mines reports

year, manufacture of these products is indicated as passing the 4.4-million-gallon daily average in the fall season. Even without considering conditions under the ideal circumstances of balanced manufacture as would result from elimination of current L.P.G. distribution bottlenecks, over-all production averages for the industry, including both natural-gasoline and cycling-plant operations, are indicated to be heading for 16.5-million gallons per day as an average for the last few months in this year. Although manufacture of L.P.G. products in 1946 fell appreciably below what would be considered a normal increase based on production in previous years, natural-gasoline and cycling-plant production as a whole followed closely the industry's normal upward trend.

Yearly total production averages from 1942 through 1946 do not bear out clearly the upswing in production that seems to be indicated for the industry in the coming months. During this period production in 1944 was sufficiently above the normal trend to offset subnormal production in 1943. When plotted these data produce a cyclic curve which indicates the industry's trend toward greater production despite the adverse conditions under which it has operated in past years. Production in 1945 ran well over the normal trend for the period and in 1946 dropped back to near normal. With similar influences acting to affect 1947 production the curve should reach the normal trend in production by the end of this year, which again places daily averages within the lower 16-million-gallons-per-day bracket.

In the expansion of the industry over the past several years cycling plants have added greatly to its production capacity. This year's figures on natural-gasoline and cycling-plant rated capacities show that cycling plants account for nearly one-fourth of the total capacity of all plants operating currently in the United States. The 45 currently active cycling plants operate to manufacture nearly 40,000,000 gal. per day of various natural-gas products. The average daily capacity of these plants is in the order of 88,000 gal. whereas that of the normal gasoline plant is slightly more than 24,000 gal. per day. In all cases Texas leads in total production, with California in second and Oklahoma in third place. Production reports on plants operating in these states when compared with total plant rated capacities show that natural-gasoline-plant operations in Texas is running close to 100 per cent of capacity, whereas Oklahoma and California fall in the 75 per cent range.



Breakdown on natural-gasoline and cycling-plant liquefied petroleum gas production. Latest Bureau of Mines reports covering January 1947 production used as basis

IN the following four pages is presented the Journal's annual survey of natural-gasoline and cycling plants. This survey, prepared by the statistical department, based on questionnaires to operating companies, lists every company, its location by state, county, and field, and gives the latest figures on rated capacity in gallons per day. Summaries of the two types of plants are presented in the two tables below.

SUMMARY OF ACTIVE GASOLINE PLANTS—1947

	No. of plants	Approximate capacity, gal. per day
Arkansas	7	185,500
California	78	2,770,500
Colorado	1	6,000
Illinois	7	519,700
Kansas	11	273,000
Kentucky	4	56,000
Louisiana	26	565,500
Michigan	2	50,000
Montana	1	25,000
New Mexico	8	361,000
Ohio	6	42,000
Oklahoma	78	1,600,300
Pennsylvania	27	91,950
Texas	145	4,600,200
West Virginia	62	349,560
Wyoming	6	109,000
Gasoline-plant totals	*469	11,605,210

SUMMARY OF ACTIVE CYCLING PLANTS—1947

California	2	150,800
Colorado	1	33,000
Louisiana	5	920,000
Pennsylvania	1	500
Texas	36	2,856,300
Cycling plant totals	45	3,960,600
Gasoline and cycling plant totals	514	15,565,810

*Plants of less than 100 gal. per day not included.

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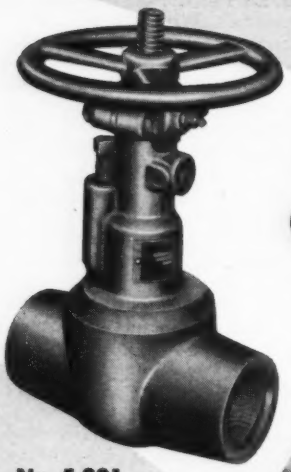

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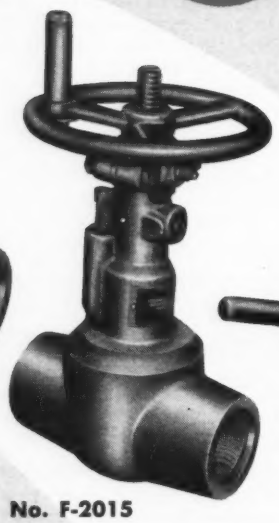

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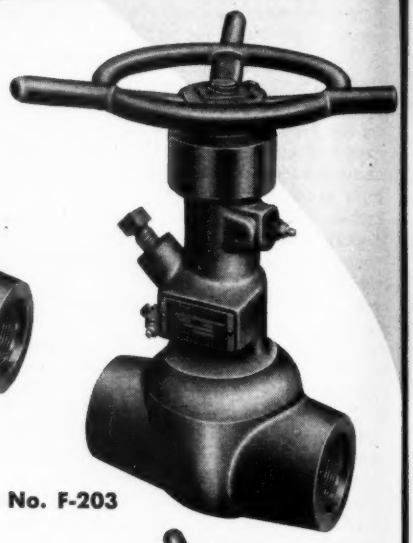

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Survey of Natural-Gasoline Plants

Compiled by The Oil and Gas Journal's Statistical Department

ARKANSAS

Company, field and county—	Approx. cap., gal./day
Arkansas Fuel Oil Co., Dorcheat, Columbia	*35,000
Barnsdall Oil Co., Midway, Miller	*13,000
Lion Oil Co., Schuler, Union	*†30,000
Magnolia Petroleum Co., Kenova, Union	*5,500
Querbes, J. R., Oil Co., Southfield, Union	10,000
Shell Oil Co., Inc., Magnolia, Columbia	*54,000
McKamie Gas Cleaning Co., McKamie, Lafayette	*38,000
Total	185,500

CALIFORNIA

Bankline Oil Co., Long Beach, Los Angeles	*13,500
Belridge Oil Co., North Belridge, Kern (2 plants)	*150,000
Coline Gasoline Co., Rincon, Ventura	*20,000
Cowan Oil & Refining Co., Rosecrans, Los Angeles	*10,000
Del Valle Gasoline Co., Del Valle, Los Angeles	*50,000
Fullerton Oil Co., Huntington Beach, Orange	100,000
General Petroleum Corp., Yorba-Brea, Orange	20,000
Burrel, Fresno	*40,000
Athens, Los Angeles	*100,000
Santa Fe Springs, Los Angeles	55,000
Wilmington, Los Angeles	60,000
Ventura, Ventura	40,000
Honolulu Oil Corp., Midway, Kern	25,000
Inglewood Gasoline Co., Potrero, Los Angeles	4,000
Lomita Gasoline Co., Long Beach, Los Angeles	*85,000
Long Beach, Los Angeles	30,000
Lytle, R. S., Operator, Coalinga Nose, Fresno	25,000
Magruder, P. S., Operator, Huffman Plant	*70,000
Western States Plant	*70,000
Natural Gasoline Co., Torrance, Los Angeles	21,000
Norwalk Co., The, Maricopa, Kern	*12,000
Santa Fe Springs, Los Angeles	*13,000
Rice Ranch Oil Co., Orcutt, Santa Barbara	3,000
Richfield Oil Co., North Coles Levee, Kern	*52,500
Long Beach, Los Angeles	20,000
Shell Oil Co., Inc., Brea-Olinda, Orange	20,000
Capitan, Santa Barbara	5,000
Dominguez, Los Angeles	25,000
Signal Hill, Los Angeles	60,000
Ten Section, Kern	*50,000
Orcutt, Santa Barbara	2,500
Ventura, Ventura	120,000
Signal Oil & Gas Co., Elwood, Santa Barbara	*20,000
Huntington Beach, Orange	*70,000
Long Beach, Los Angeles	*55,000
Standard Oil Co. of California, 19-B Coalinga, Fresno	38,000
Greeley, Kern	*20,000
Murphy-Coyote, Los Angeles	80,000
Huntington Beach, Orange	*40,000
Inglewood, Los Angeles	35,000
11-P Kettleman, Kings	*50,000
3-P Kettleman, Kings	*78,000
33-J Kettleman, Kings	*50,000
Lost Hills, Kern	4,000
1-C Midway, Kern	20,000
7-D Midway, Kern	20,000
29-G Midway, Kern	12,000
31-E Maricopa, Kern	10,000
Wasco, Kern	6,000
32-Z Mount View, Kern	16,000
Santa Fe Springs, Los Angeles	40,000
Torrance, Los Angeles	12,000
Seal Beach, Orange	25,000
Superior Oil Co., Rio Bravo, Kern¶	*†20,000
Texas Co., The, Montebello, Los Angeles	40,000
Santa Fe Springs, Los Angeles	35,000
Shiell's Canyon, Ventura	40,000
Signal Hill, Los Angeles	60,000
Tide Water Associated Oil Co., Ventura (3 plants)	*130,000
Union Oil Co., Brea-Olinda, Orange	22,500
Dominguez, Los Angeles	50,000
Kettleman Hills, Kings and Fresno	30,000
Playa del Rey, Los Angeles	15,000
Rosecrans, Los Angeles	25,000
Santa Fe Springs, Los Angeles	50,000
Orcutt, Santa Barbara	*26,000
Santa Maria, Santa Barbara	*36,000
Richfield, Orange	10,000
U. S. Navy Petroleum Reserve No. 1, Elk Hills, Kern‡	†5,000

CALIFORNIA (Continued)

Company, field and county—	Approx. cap., gal./day
Universal Consolidated Oil Co., Rosecrans, Los Angeles	8,000
West Coast Refining Co., Richfield, Orange	*50,000
West Rosecrans Gasoline Co., Rosecrans, Los Angeles	5,000
Wilmington Gasoline Co., Wilmington, Los Angeles	*40,000
Total	2,770,500

COLORADO

Mountain States Oil Corp., Trinidad, 3-33s-62w	6,000

ILLINOIS

Arkansas Fuel Oil Co., Robinson, Crawford	500
Carter Oil Co., Louden, Fayette	*60,000
Ohio Oil Co., Casey	1,200
Texas Co., The, Hoodville, Hamilton	*70,000
Salem, Marion	*175,000
Warren Petroleum Corp., Crossville, White	*100,000
Salem, Marion	*105,000
Miscellaneous	8,000
Total	519,700

KANSAS

Barnsdall Oil Co., Rainbow Bend, Sumner	*3,500
Cities Service Oil Co., Main Line, Sedgwick	*72,000
Burrton, Reno	*20,000
Main Line, Cowley	*20,000
Flynn Oil Co., Otis, Rush	*6,500
Kansas P. & L. Co., Medicine Lodge, Barber	15,000
McPherson, McPherson	15,000
Northern Natural Gas Co., Hugoton, Stevens	*40,000
Panhandle Eastern Pipeline Co., Liberal, Seward	50,000
Skelly Oil Co., Cunningham, Kingman	*25,000
Texas Co., The, Eastman, Cowley	*6,000
Total	273,000

KENTUCKY

Ashland Oil & Refining Co., Fixer, Lee	4,000
Kentucky-West Virginia Gas Co., E. Ky., Floyd	5,000
Virginian Gasoline & Oil Co., Catlettsburg, Boyd	*30,000
Warfield, Martin	*17,000
Total	56,000

LOUISIANA

Company, field and parish—	
Anchor Gasoline Corp., Eola, Avoyelles	*40,000
Cheneyville, Rapides	8,000
Arkansas Fuel Oil Co., Homer, Claiborne	5,000
Shreveport, Caddo	*15,000
Sligo, Bossier	*6,000
Bisteneau, Bienville	*15,000
Driscoll, Lincoln	5,000
Rodessa, Caddo	*10,000
Arkla Oil Co., Rodessa, Caddo	*60,000
Claiborne Gasoline Co., Lisbon, Claiborne	60,000
Coltexo Corp., Rodessa, Caddo	40,000
Continental Oil Co., English Bayou, Calcasieu	14,000
Tepetate, Jefferson Davis	4,000
Ville Platte, Evangeline	*42,000
Glen Rose Gasoline Co., Rodessa, Caddo	*30,000
Great National Oil Corp. of Louisiana, Rodessa, Caddo	35,000
Gulf Oil Corp., Homer, Claiborne	8,500
Haynesville Operators, Haynesville, Claiborne	*†30,000
Ohio Oil Co., Haynesville, Claiborne	2,000
Shell Oil Co., Inc., Iowa, Calcasieu	15,000
Stanolind Oil & Gas Co., Pine Island, Caddo	4,000
Texas Co., The, Lafitte, Jefferson	9,000
United Gas Pipe Line Co., Rodessa, Bossier	*50,000
Cotton Valley, Webster	*20,000
Koran, Bossier	*18,000
Sugar Creek, Claiborne	*20,000
Total	565,500

NATURAL GASOLINE SECTION

MICHIGAN

Company, field and county—	Approx. cap., gal./day
Grimes, Otha H., Greensdale, Isabella	*5,000
West Michigan Consumers, Reed City, Osceola	*45,000
Total	50,000

MONTANA

Union Oil Co., Cut Bank, Glacier	25,000

NEW MEXICO

El Paso Natural Gas Co., Jal 1, Lea	*25,000
Jal 2, Lea	*50,000
Loco Hills Press. Maint. Co., Loco Hills, Eddy	10,000
Maljamar Coop. Repress, Agreement, Artesia, Eddy	*†6,000
Phillips Petroleum Co., Eunice, Lea	*100,000
Hobbs, Lea	*80,000
Skelly Oil Co., Eunice, Lea	*35,000
Warren Petroleum Corp., Monument, Lea	*55,000
Total	361,000

OHIO

Preston Oil Co., Elk, Noble	4,000
Homer, Licking	10,000
Pavonia, Richland	10,000
Sugar Grove, Fairfield	10,000
York, Medina County	4,000
River Gas Co., The, Ludlow, Washington	4,000
Total	42,000

OKLAHOMA

Anchor Petroleum Co., Coyle, Payne	*15,000
Barnsdall Oil Co., Seminole, Pottawatomie	*20,000
Avant, Osage	2,500
Carter Oil Co., Grisso, Seminole	*75,000
Fitts, Pontotoc	*50,000
Cromwell, Seminole	45,000
Cimarron Gasoline Corp., Guthrie, Logan	10,000
Coyle, Logan	15,000
Cities Service Oil Co., Guymon, Texas	20,000
Bodine, Oklahoma	*60,000
Tallant, Osage	20,000
Continental Oil Co., Billings, Noble	*11,000
Crosbie, J. E., Inc., Fitts, Pontotoc	*20,000
Stroud, Lincoln	*10,000
Deep Rock Oil Corp., Hawk, Payne	1,000
Devonian Oil Co., O.N.G. Main Line, Creek	*20,000
Eason Oil Co., Crescent, Logan	*25,000
Frame Natural Gas Co., Plant 2, Pawnee	2,500
Grimes, Chas. and Otha, Weleetka, Okfuskee	5,000
Okemah, Okfuskee	3,000
Grimes, Otha H., Wetumka, Hughes	*5,000
Pauls Valley, Garvin	*20,000
Grimes, Otha H., and Roy Neil, Drumright, Creek	4,000
Gulf Oil Corp., Boston, Osage	1,500
Burbank, Osage	10,000
Kiefer, Creek	20,000
Mission, Seminole	12,500
Keener Oil & Gas Co., Butler, Custer	*15,000
Lone Star Gas Co., Hollis, Harmon	*25,000
Magnolia Petroleum Co., Davenport, Lincoln	3,600
Graham, Carter	4,600
Oilton, Creek	18,000
Stonewall, Pontotoc	*30,000
St. Louis, Pottawatomie	*16,000
Mid-Continent Petroleum Corp., Leonard 9, Tulsa	200
Sawyer 3, Creek	7,000
Stillwater 18, Payne	5,000
Stone Bluff 4, Wagoner	600
Cromwell 7, Seminole	15,000
Neal Gasoline Co., Osage, Pawnee	4,800
Peppers Refining Co., W. Edmond, Oklahoma	30,000
Plant 1, Oklahoma	20,000
Phillips Petroleum Co., Reserve, Osage	*25,000
Oklahoma City, Oklahoma	*100,000
Wewoka, Seminole	30,000
Edmond, Oklahoma	*60,000
Denoya, Osage	*60,000
Pioneer Corp., Bixby	1,000
Powers, M. F., Depew, Creek	*2,500
Pure Oil Co., Cushing, Creek	5,000
Glenn Pool, Creek	6,000
Shell Oil Co., Inc., Osage, Osage	10,000
Healdton, Carter	12,000
Lucien, Noble	*36,000
Hewitt, Carter	16,000
Tonkawa, Noble	10,000

OKLAHOMA (Continued)

Company, field and county—	Approx. cap., gal./day
Sinclair Prairie Oil Co., Seminole 12, Seminole	50,000
Lima 13, Seminole	*50,000
St. Louis 14, Pottawatomie	80,000
Drumright 2, Creek	25,000
Shamrock 3, Creek	20,000
Covington 6, Garfield	*15,000
Skelly Oil Co., Fairfax, Osage	*50,000
Naphtha, Osage	*38,000
Lyman, Osage	*8,000
Swab, John F., Edmond, Oklahoma	3,000
Texas Co., The, Blackbird, Osage	*3,500
Davenport, Lincoln	*12,000
Z. Moore, Creek	7,000
Tide Water Associated Oil Co., Drumright, Creek	15,000
Victor Gasoline Co., Bristow, Creek	*2,500
County Line, Lincoln	1,000
Warren Petroleum Corp., Graham, Carter	*22,000
Madill, Marshall	*60,000
Maud, Pottawatomie	*35,000
Fittstown, Pontotoc	*18,000
Stroud, Lincoln	*9,000
Wright, Rosa B., Kellyville, Creek	5,000
Total	1,600,300

PENNSYLVANIA

Bayliss & Bayliss, Titusville	10,000
Clinger Oil & Gas Co., Tidioute, Fagundus	1,000
Tidioute, Hastings	1,000
Crawford & Gregory, Emlenton, Fryburg	500
Ellenburger, W. J. & Sons, Karns City	300
Elliott Brothers, Chicora	500
Equitable Gas Co., Clarksville, Washington	2,000
Rogersville, Green	10,000
Harvey, John J. estate, Titusville, Pleasantville	500
Haskell, Roth & Bayless, Tidioute, Warren	10,000
Hickey & Russell, Henry's Mill	300
Jennings, E. H., Bros. Co., McDonald (2 plants)	1,700
Mars Co., Pinegrove, Venango	4,000
Van, Venango	*7,500
Lewis Run, Keane	6,500
Pennsylvania Oil Co., Sheffield, Warren	10,000
Peoples Natural Gas Co., Brave, Greene	20,000
South Penn Oil Co. (5 plants)	1,900
Surety Oil Co., Titusville	1,000
Tiona, Warren	500
Trueman's Forrest	150
Wible, W. Paull, Karns City	100
Miscellaneous	2,500
Total	91,950

TEXAS

Railroad Commission District 2

Clymore Co., Inc., Clymore, Refugio	20,000
Humble Oil & Refining Co., Heyser, Calhoun	10,000

Railroad Commission District 3

Absorption Plant, Inc., Winnie, Chambers	*65,700
Danciger Oil & Refining Co., Pledger, Matagorda	*40,000
Del Rey Petroleum Co., Hardin, Liberty	*10,000
Hamman Oil & Refining Co., Hamman, Matagorda	*13,000
Humble Oil & Refining Co., Conroe, Montgomery	18,000
Tomball, Harris	34,000
Clear Lake, Harris	35,000
Midland Gasoline Co., Conroe, Montgomery	*35,000
Warren Petroleum Corp., Fairbanks, Harris	*40,000
West Gasoline Co., Cleveland, Liberty	*12,000

Railroad Commission District 4

Continental Oil Co., Rincon 38, Starr	*18,000
Duval Gasoline Co., Benavides, Duval	*10,000
Humble Oil & Refining Co., Flour Bluff, Nueces	14,000
Sinclair Prairie Co., Plant 20, San Patricio	*30,000
Smith Brothers Refining Co., Inc., Welder, San Patricio	15,000
Southern Minerals Corp., Saxet, Nueces	*25,000
Bishop, Nueces	*†15,000
Stanolind Oil & Gas Co., Luby, Nueces	*†30,000
Warren Petroleum Corp., Stinton, San Patricio	*18,000
United Gas Pipe Line Co., Agua Dulce, Nueces	45,000

Railroad Commission Districts 5 and 6

Arkansas Fuel Oil Co., Waskom, Harrison	*12,000
East Texas, Gregg	*35,000
Carthage, Panola (2 plants)	*71,250
Smithland, Marion	5,000
Jefferson, Marion	*10,000
Chicago Corp., Carthage	*80,000
Gregg-Tex Gasoline Corp., Gregg-Tex, Gregg	*125,000

The Coring Line that helps to whip corrosion

For coring work, many users prefer a bethanized 6 x 7 line, 1/2-in. or 9/16-in. diameter.

You've probably seen a coring line hosed down thoroughly and reeled on the drum wringing wet. Then maybe the line wasn't used again for a month.

That sort of treatment is an open invitation to corrosion.

One of the best ways to lick it is to install a coring line protected by bethanized coating. The bethanizing process, exclusive with Bethlehem, adds a highly-pure, uniform layer of zinc to every wire in the line—*a coating with full Government-specification thickness.* This zinc "armor" is applied electrolytically in such a way that the strength and toughness of the wire are not impaired in any manner. Further, the coating is so ductile that it virtually eliminates peeling or cracking.

Remember, even the inner wires of your bethanized coring line wear this safety jacket that resists corrosion. The bethanized coating not only combats moisture, but the acids and gases of sour-well country.

Ask for more details of this *protected* bethanized coring line.

Applying coating in a bethanizing unit.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

When you think WIRE ROPE . . . think BETHLEHEM

TEXAS (Continued)

Company, field and county—	Approx. cap., gal./day
Gulf Oil Corp., Overton, Rusk	*12,500
Kilgore, Gregg	*40,000
Hargraves, F. E., Boggey Creek, Anderson	3,000
Humble Oil & Refining Co., American, Gregg	44,000
Kilgore, Gregg	44,000
London, Rusk	*108,000
Lisbon Gasoline Co., E. Texas, Rusk	*50,000
Lone Star Gas Co., Trinidad, Henderson	*40,000
Magnolia Petroleum Co., Sabine, Gregg	*40,000
Mid-Co Gasoline Co., Mid-Co., Henderson	*6,000
Natural Gasoline Corp., Hawkins, Wood	*100,000
Nine Oaks Gasoline Co., Gladewater, Gregg	750
Parade Co., E. Texas, Rusk	*125,000
Pewitt, P. H., Joaquin, Shelby	2,000
Phillips Petroleum Co., Lodi, Cass	25,000
Pure Oil Co., Van, Van Zandt	*34,000
Sinclair Prairie Oil Co., Plant 18, Gregg	*80,000
Plant 19, Rusk	*80,000
United Gas Pipe Line Co., Carthage, Panola	*165,000
Warren Petroleum Corp., Gladewater, Gregg	*175,000

Railroad Commission District 7

Anzac Oil Corp., Overall, Coleman	500
Big Lake Oil Co., Big Lake, Reagan	37,000
Consolidated Gasoline Co., Martin, Eastland	4,000
Desdemona Gasoline Co., Desdemona, Comanche	3,000
Lone Star Producing Co., Brooks, Stephens	35,000
Plant 108, Eastland	35,000
R.F.C. Plant, Eastland	*80,000
Lone Star Gas Co., Gordon, Palo Pinto	*25,000
Cisco, Eastland	10,000
Magnolia Petroleum Co., Desdemona, Eastland	4,500
Olden, Eastland	5,000
Phillips Petroleum Co., Eliasville, Stephens	15,000
Ibex, Shackelford	12,000
Roeser & Pendleton, No. 1, Shackelford	6,000
No. 3, Shackelford	2,000
Rudco Oil & Gas Co., Desdemona, Eastland	5,000
Rising Star, Brown	5,000
Texas Pacific Coal & Oil Co., Caddo, Stephens	*10,000
Warren Petroleum Corp., Breckenridge, Stephens	*60,000

Railroad Commission District 8

Cabot Carbon Co., Wickett, Ward	*30,000
Kermit, Winkler	*40,000
Cities Service Oil Co., Odessa, Ector	30,000
Gulf Oil Corp., Monahans, Ward	†15,000
Magnolia Petroleum Co., Kermit, Winkler	†18,000
Phillips Petroleum Co., Fullerton, Andrews	*60,000
Goldsmith, Ector	*60,000
Crane, Crane	*35,000
Judkins, Ector	*40,000
Seminole, Gaines	*50,000
Shell Oil Co., Inc., Shell-Coltexo 1, Yoakum	58,000
Shell-Coltexo 2, Yoakum	58,000
Standard Oil Co. of Texas, Ward, Ward	22,000

Railroad Commission District 9

Continental Oil Co., K.M.A. Plant, Wichita	†60,000
Deep Oil Development Co., Wilson, Archer	*†1,000
K.M.A. 2, Wichita	*†2,000
Highlander Gasoline Co., Reed, Montague	4,000
Magnolia Petroleum Co., Burkburnett, Wichita	†4,000
Electra, Wilbarger	†6,000
Nash, Gasoline Co., South Bend, Young	*20,000
Peters, Young	*8,000
Phillips Petroleum Co., Mankins, Wichita	*45,000
Skelly Oil Co., Burkburnett, Wichita	*7,000
Ramming, Wichita	1,500
Texas Co., The, Burkburnett, Wichita	5,000
Electra, Wichita	15,000
Tucker Oil Co., Burkburnett, Wichita	†1,500
Waggoner, W. T., estate, Waggoner, Wilbarger	7,000
Warren Petroleum Corp., Holliday, Archer	*80,000

Railroad Commission District 10

Canadian River Gas Co., Bivins, Moore	45,000
Cannon Gasoline Co., Cannon, Potter	*10,000
Cities Service Oil Co., Pampa, Gray	*25,000
Coltexo Corp., Lefors 78-1, Gray	40,000
Columbian Gasoline Corp., Shamrock 16, Wheeler	10,000
Hagy, Harrington & Marsh, Cargray, Carson	35,000
Henderson Trust No. 2, Sanford, Hutchinson	40,000
Huber, J. M., Corp., No. 1, Hutchinson	25,000
Magnolia Petroleum Co., Kingsmill, Gray	9,000
Sunray, Moore	22,000
Phillips Petroleum Co., Bowers, Gray	*25,000
Canadian, Hutchinson	*40,000
Carson, Carson	*20,000
Gray, Gray	*75,000

TEXAS (Continued)

Company, field and county—	Approx. cap., gal./day
Hansford, Hansford	*55,000
Johnson, Hutchinson	*50,000
Lefors, Gray	*25,000
North, Gray	*30,000
Pampa, Gray	*50,000
Pantex, Hutchinson	*30,000
Rock Creek, Hutchinson	*85,000
Sanford, Hutchinson	*50,000
Sneed, Moore	*100,000
Portland Gasoline Co., Pampa, Gray	*30,000
Shamrock Oil & Gas Corp., The, McKee, Moore	*110,000
Shell Oil Co., Inc., Panhandle, Carson	25,000
Panhandle, Gray	15,000
Panhandle	5,000
Skelly Oil Co., Armstrong, Hutchinson	*12,000
Schafer, Carson	*40,000
Crawford, Hutchinson	*25,000
Watkins, Carson	*17,000
Smith Bros. Refining Co., Inc., Sitter, Wheeler	40,000
Texoma Natural Gas Co., Fritch, Hutchinson	85,000
Stinnett, Moore	18,000
Warren Petroleum Corp., McLean, Gray	*55,000
West Texas Gas Co., Fritch, Hutchinson	25,000
Total	4,600,200

WEST VIRGINIA

Carnegie Natural Gas Co., Hundred, Wetzel	700
Falling Rock Producing Co., Falling Rock	1,500
Hapgood, Roswell T., & Co., Cedar Grove, Kanawha	6,500
Henaghan & Hanlon, Inc., Sistersville, Big Knot	1,000
Burns	800
Hammee	2,000
Harrisville	500
Highland	800
Murphy	300
Nye	1,500
Rock Run	600
Hope Natural Gas Co., Bristol, Harrison	8,000
Cornwell, Kanawha	20,000
Goff, Harrison	5,000
Hastings, Wetzel	*90,000
Kennedy, Lewis	20,000
Waverly, Wood	9,500
Jennings, E. H., Bros. Co., Jacksonburg, Wetzel (2 plants)	1,500
Owens, Libby-Owens Gas Dept., South Maiden	*10,000
Pure Oil Co., The, Dawes, Cabin Creek	*7,000
South Penn Oil Co., Blackshere, Monongalia	700
Clay, Roane	1,200
Edgell, Roane	1,200
Fairview, Marion	1,680
Falling Rock, Roane	600
Griffith, Kanawha	1,000
Hartley, Ritchie	1,000
Lynch, Harrison	1,440
Metz, Monongalia	500
Morgan, Wetzel	2,000
Pine Grove, Wetzel	1,200
Rock Creek, Roane	750
Stringtown, Tyler	1,000
Tanner, Gilmer	900
Victor, Kanawha	2,500
Miscellaneous (15 plants)	3,000
Union Gasoline & Oil Corp., Moundsville, Marshall	3,000
Jane Lew, Lewis	3,000
Porters Falls, Wetzel	10,000
Virginian Gasoline & Oil Co., Clendenin, Kanawha	*46,000
Hubball, Lincoln	12,000
Jarretts Fords, Kanawha	1,800
Mammoth, Kanawha	2,500
Ona, Cabell	18,000
St. Albans, Kanawha	3,500
Sandyville, Jackson	*34,000
Three Mile, Kanawha	3,500
Miscellaneous	4,350
Total	349,560

WYOMING

Continental Oil Co., Lance Creek, Niobrara	*40,000
Northern Utilities Co., Sand Draw, Fremont	4,500
Ohio Oil Co., Grass Creek, Hot Springs	3,600
Rock River, Carbon	5,000
Sinclair Wyoming Oil Co., Lost Soldier, Baroil	†4,900
Stanolind Oil & Gas Co., Salt Creek, Natrona	*51,000
Total	109,000

*L.P.G. produced. †Also pressure maintenance or repressure. ‡Operated by others. ¶Partnership.

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**Crude, Product, Ethyl (deleading & gas freeing)*

EASTERN TANK CLEANING SERVICE can pay for itself by reclaiming the sludge removed from tank bottoms . . . Eastern crews are highly skilled in their work and have all the equipment required, including patented vacuum pumps, portable steam plants, etc., they operate in accordance with the strictest safety rules and provide insurance coverage for property damage, public liability, etc., . . . an all inclusive Tank Cleaning Service being utilized by many leading oil companies . . . names on request.

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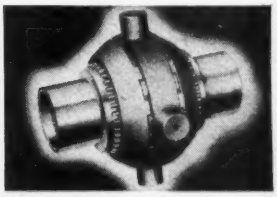
DETROIT

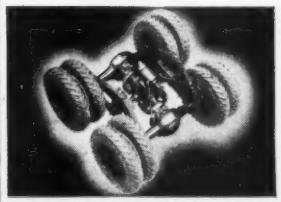
NoSPIN Differential



With a NoSPIN differential installed in your truck axle, your vehicle can't get stuck in mud, snow or ice due to loss of traction under one wheel, because both rear wheels must rotate. Greater driving safety, less tire wear.

AUTOMOTIVE

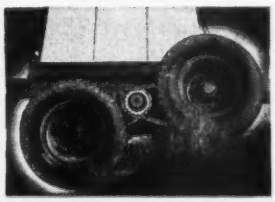
THORNTON DRIVE



It makes a heavy duty six wheeler (up to 32,000 G.V.W.) out of a medium 1½-2 ton truck. Four independently-driven rear wheels increase the capacity and earning power of your truck 100%—yet it costs much less than a heavy-duty 4-wheeler of equal capacity.

PRODUCTS

CHAIN DRIVE *COMING SOON!*



Watch for this revolutionary new chain drive that will make your heavier chassis a six-wheeler with a G.V.W. up to 44,000 lbs. Maximum traction from four-rear-wheel positive drive—high payload capacity—low maintenance cost—peak performance under the most exacting conditions.

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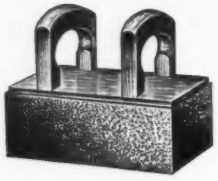
JUST A FEW ITEMS FROM OUR NEW CATALOG



New Pipe Intersection Compass

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NATURAL GASOLINE SECTION

Survey of Cycling Plants

Company, plant and county—	Approx. cap., gal./day
CALIFORNIA	
Ohio Oil Co., South Coles Levee, Kern	*100,800
Western Gulf Oil Co., Operator, Paloma, Kern	50,000
Total	150,800
COLORADO	
Continental Oil Co., Walden, Jackson	33,000
LOUISIANA	
Barnsdall Oil Co., Benton, Benton	*†170,000
Cotton Valley Oper. Comm., Webster	*126,000
Stanolind Oil & Gas Co., So. Jennings, Jefferson Davis	*50,000
Texas Co., The, Erath, Vermilion	504,000
Bateman Lake, St. Mary	70,000
Total	920,000
PENNSYLVANIA	
Harvey, Mrs. Alice G., Titusville, Forrest	500
TEXAS	
Agua Dulce Co., The, Banquete, Nueces	*40,000
American Liberty Oil Co., Blessing, Matagorda	40,000
Grapeland, Houston	50,000
American Republics, Joe's Lake, Tyler	12,000
Anco Gas Corp., Long Lake, Anderson	50,000
Chicago Corp., The (Gulf Plain), Stratton, Nueces	*80,000
Coastal, Nueces	*80,000
Wardner, Nueces	*80,000
Distillate Prod. Corp., North Houston, Harris	*42,000
Duval Gasoline Co., Benavides, Duval	*5,700
Francitas Gas Co., Francitas, Jackson	70,000
Gasoline Production Corp., Bee	65,000
Geier-Jackson Recycling Co., Grapeland, Houston	75,000
Gulf States Recycling Co., San Salvador, Hidalgo	†12,600
Harrell, H. M., Ehrhardt, Harris	40,000
Humble Oil & Refining Co., Katy, Waller	*480,000
Hunt Oil Co., Long Lake, Anderson	50,000
Killiam, O. W., Joyce Richardson, Harris	15,000
La Gloria Corp., La Gloria, Jim Wells	*320,000
Lockhart, L. M., Banquete, Nueces	60,000
Lone Star Prod. Co., Grapeland, Houston	100,000
Opelika, Henderson	*175,000
Carthage, Panola	100,000
Chapel Hill, Gregg	*‡85,000
Roeser & Pendleton, No. 4, Anderson	5,000
Shell Oil Co., Inc., Sheridan, Colorado	*282,000
Skelly Oil Co., Kingsmill, Gray	*80,000
Skinner & Eddy Corp., Alice, Jim Wells	*42,000
Stanolind Oil & Gas Co., La Rosa, Refugio	*44,000
Superior Oil Co., The, Lake Creek, Montgomery	*140,000
Sun Oil Co., Seabreeze, Chambers	14,000
Willow Slough, Chambers	12,000
Tide Water Asso.-Seaboard, Cayuga 1 and 2, Anderson¶	30,000
Long Lake, Anderson	*40,000
Trinity Gas Corp., Sejita, Duval	*40,000
Total	2,856,300

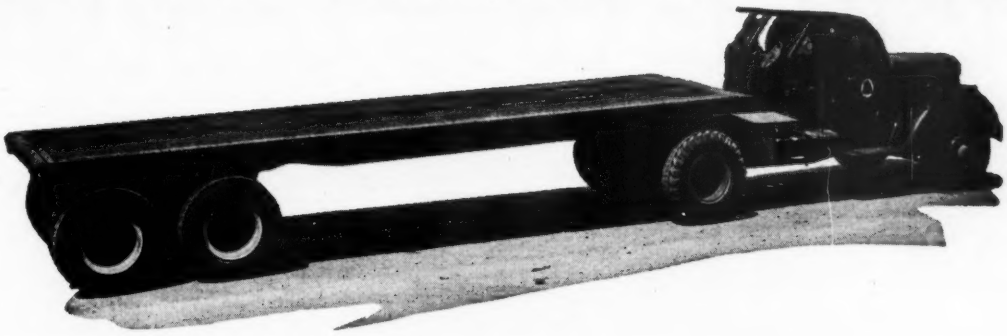
*L.P.G. produced. †Distillate. ‡Under construction. ¶Partnership.

Cycling Plants to Stop Flaring Of ¼ Billion Feet of Texas Gas

OUTSTANDING efforts of conservation agencies and the industry itself accounts for the remarkable and rapid reduction of the amounts of gas burned in flares in the immediate past. Cycling plants already planned or under construction will process at least a quarter billion cubic feet of raw or dry gas now being flared in Texas.

The capacity for liquid hydrocarbon production added to the natural-gasoline industry by cycling plants is large and increasing. In a total of 15½ million gallons of liquids per day, the 45 cycling-recovery plants contribute more than one-fourth the capacity, with a maximum size of 480,000 gal. per day and an average capacity of 90,000 gal. per day. The 469 natural-gasoline plants average 24,750 gal. per day.

HERE'S AN OIL FIELD TRAILER WITH *STAMINA!*



This serviceable American-built tandem platform trailer was developed by our engineering staff with the cooperation of hauling contractors and producers throughout the industry. It's sturdily-built to meet the most rugged hauling tests . . . designed and constructed from the standpoints of endurance, versatility and economical operation. The model S-F 42-T shown above is only one of a *complete line* of oil field platform and pole trailers—both single axle and tandem models in lengths to suit your needs. Prompt delivery assured. Write us TODAY for complete information—no obligation, of course.

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Drilling Costs Lowered 25% In Rangely Field

by Neil Williams

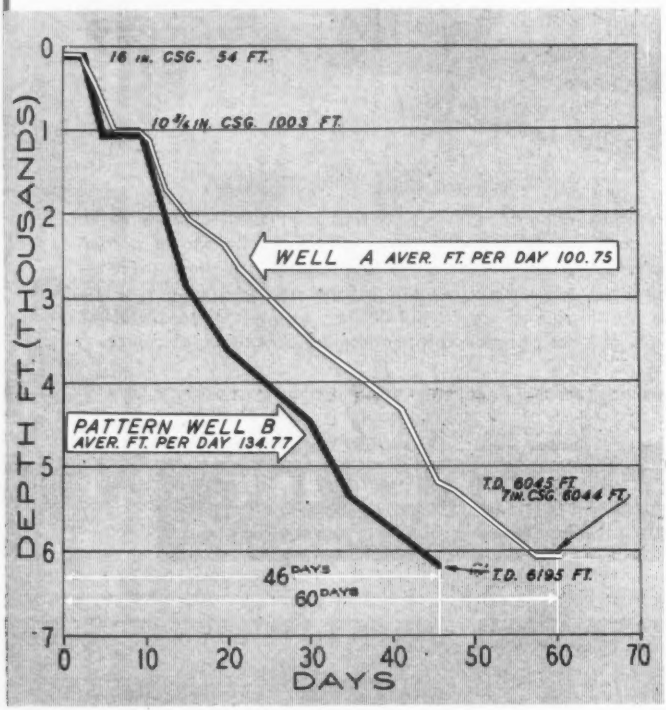
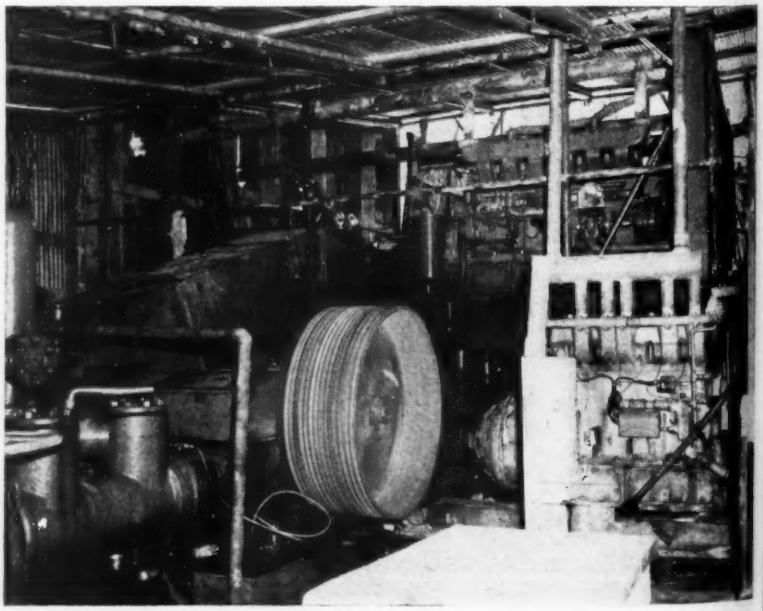


Fig. 1, at left, shows a typical drilling-time curve to top of oil sand showing comparison of currently drilled well (Well A) with pattern, or record-time well. Pattern well now is one drilled to sand in 38 days

OPERATORS and contractors in the Rangely field of northwestern Colorado are making steady progress in their efforts to reduce drilling time and well costs. From a total of 80 to 100 days a year ago, normal overall well time, not counting cored wells, has been cut to from 65 to 80 days. Correspondingly, well costs in the same period have been reduced from more than $200,000 to a figure of from $140,000 to $150,000. It is foreseen that in the early future it will be possible to drill and complete wells normally in not more than 60 days.

Reductions in time and costs reflect the gradual development of ways and means to insure the most effective drilling control possible. From experience gained in the completion of more than than 200 wells to date, operators and contractors are attaining greater proficiency in coping with the various formational hazards encountered, and by special techniques being initiated they are becoming better able to avoid much hole trouble which formerly resulted in costly interruptions in drilling. Through more appropriate drilling programs being devised they are realizing substantial savings in casing, drilling mud, and other equipment and material expenditures.

In a previous article[1] savings in



Dual-drive mud-pump installation in Rangely field. Pump has drive from compound on draw-works engines on main engine floor with auxiliary drive from independent engine, seen at right

time and costs being accomplished by use of diamond-bit core barrels for coring the producing section were discussed. Although time and costs of wells in which the producing section has been cored are not included in the above comparisons of normal over-all well time, the section is being cored with diamond bits in less time than ordinarily is required by regular drilling. Diamond bits only recently have been introduced in the field, but in view of the savings that have been realized in the wells in which they have been tried, it is possible their use may become standard procedure in penetrating the section and prove a means of reducing over-all well time. Full hole-sized bits (6⅛ in.) are being used so that no reaming is necessary to give a finished hole after coring.

Depth of Producing Section

The producing section, the Weber sandstone, is topped at depths ranging from 5,500 ft. to 6,300 ft. Up to 650 ft., depending on the structural position of wells above the water level, is taken in for completions. The formation is a very hard, fine-grained sand which has been very difficult and slow to penetrate. Normal time for drilling the full section is from 15 to 25 days. Conventional coring has required from 45 to 75 days with from 40 to 50 core heads and at a cost of from $32,000 to $40,000. With diamond bits the section has been penetrated in as little as 10 to 12 days, and in several cases with only one bit.

Wells now are being drilled to the top of the producing sand in from 45 to 60 days as compared with from 60 to 70 days a year ago. In a well drilled recently this time was cut to approximately 38 days, whereas the best time a year ago was 55 days. Because of the much greater footage involved in this part of the hole as compared with that of the producing sand, and because completion procedure, involving acidizing, shooting, and cleaning out, offers little opportunity for additional time economy, it is to the savings in time that can be effected in drilling the formations to the producing sand that operators and contractors look largely for further reductions in over-all well time.

Loss of circulation in fractured zones and crevices occurring in the Mancos shale section[2] has been one of the chief problems faced in drilling the upper part of the hole. Loss of time incurred by interruptions in drilling to seal off fractured zones and regain and maintain circulation has been costly in many wells, not to mention the physical loss of mud and expenditures made for formation-sealing materials and cement and extra-long strings of surface pipe often required to set through these zones. Although the problem has not been overcome entirely, methods and precautions now being followed in drilling these zones are greatly minimizing the difficulties being encountered, resulting in substantial savings in time and cost.

The Mancos shales extend from the surface to a depth of approximately 3,000 ft. Fractured zones occur irregularly through the entire section although generally the worst of them are within the first 2,500 ft. The chief complication lies in the fact that when the trouble in one zone is corrected there is no assurance that additional zones will not be encountered and that in drilling deeper the shallower zones will not be reopened.

(Continued on page 172)

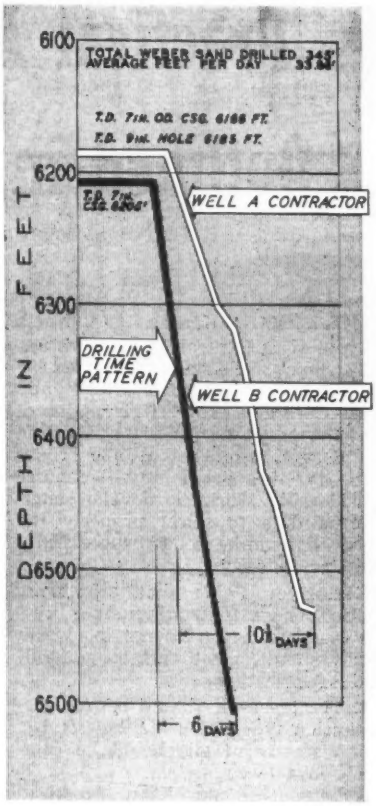
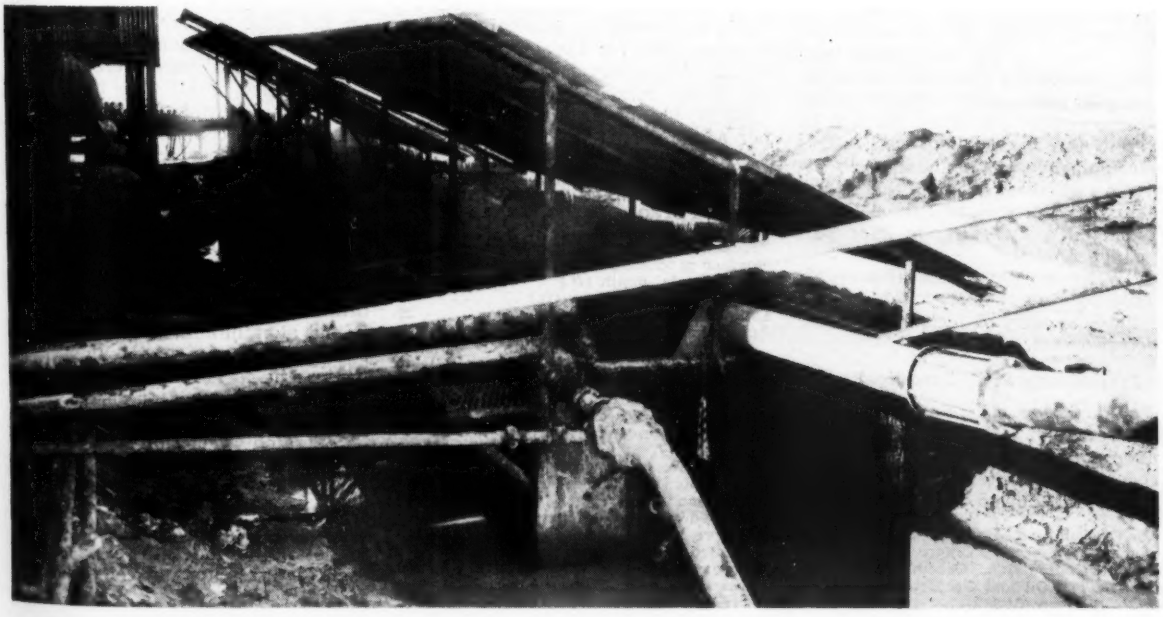


Fig. 2—(Above) Typical drilling time for oil-pay section at Rangely, showing comparison of currently drilled well (Well A) with pattern or record-time well (Well B). (Below) More effective mud control has been a factor in reducing well time. Typical mud-conditioning system at Rangely with series of steel mud tanks, covered to prevent contamination by snow or rainfall



Practical Aspects of Water Flooding Outlined in Three Successful Projects

by Halbert M. McClain

OKLAHOMA, Kansas, and North and West Central Texas have 88,000 stripper wells, one-fourth or 22,000 of which are located in North and West Central Texas.* It is apparent that the possibility of water flooding in West Central and North Texas alone is enormous and will require considerable work to develop engineering data to select properly the leases that can be flooded successfully and economically.

Leases or fields that are being studied for water flooding under present economic conditions in North Texas should meet certain generalized specifications:

1. The reservoir should be: (a) gas-expansion type; (b) a blanket sand.
2. Viscosity of oil should be relatively low, 15 cp. or less.
3. Leases should have produced very little water during their primary producing life.
4. Wells can be 2,000 ft. in depth or less.
5. The 2,000-ft. wells should have 25 ft. of permeable productive sand, or more, while 500 to 1,000-ft. wells should have at least 12 to 18 ft. of sand.
6. Porosity of sand should be about 18 per cent or more, and the permeability, regardless of magnitude, should be relatively uniform.
7. Accumulated past primary oil production should be 25 or 30 per cent or less of the theoretical total void space in the reservoir, while allowing 30 per cent for connate water.
8. Particular attention should be paid to the method any wells have been plugged and abandoned to ascertain whether or not the leases might be watered out by the slow encroachment of water from improperly plugged wells.
9. Water supply in the area—preferably subsurface salt water—should be ample to carry on a complete water flood program.

Preliminary Field Investigation

Primary production data.—The data that were utilized and developed for a recent water flood (Lease A in this paper) are presented to illustrate the procedure followed and the factors considered while making a preliminary study of a water flood program. Table 1 presents the preliminary production data for the entire project. Among important data in Table 1 is the gross primary oil production—3,549,000 bbl. of oil or 6,572 bbl. of oil per acre. Also, it is to be noted that Lease A should produce only an additional 354,000 bbl. of oil under methods being used prior to water flooding. Ordinarily a reservoir with suitable flooding characteristics will produce by flooding a volume of oil comparable to the primary production. To maintain a conservative evaluation, it was estimated that Lease A should produce about 75 per cent of its primary production or 5,000 bbl. of oil per acre—2,700,000 bbl. of oil—for the entire project under a suitable water flood.

*E. C. Dahlgren, National Stripper Well Survey, 1945. Presented before Interstate Oil Compact Commission, December 10, 1946. (Also see The Oil and Gas Journal, December 21, 1946, pp. 54-55.)

Halbert M. McClain has charge of secondary-recovery operations, including gas repressuring and water flooding, salt-water disposal, and chemical engineering for the production department of Magnolia Petroleum Co., Dallas. His experience embraces drilling and production engineering as applied to all phases of both primary and secondary production operations, and has been gained in the Mid-Continent area from Illinois to the Gulf Coast, and from Louisiana to New Mexico. He is a graduate of Oklahoma A. & M., where he studied petroleum and chemical engineering.

This article is an abridgement of an oral presentation at the annual secondary-recovery meeting of the North Texas Oil and Gas Association at Wichita Falls, March 8, 1947. The subject also has been discussed by the author at meetings of the Dallas Petroleum Engineers Club, and the Mid-Continent section of A.I.M.E., at Tulsa.

TABLE 1—PRELIMINARY PRODUCTION DATA FOR LEASE "A," MAGNOLIA PETROLEUM CO. ET AL

Producing sand	Bartlesville
Number producing wells	54
Average total depth (ft.)	1,975
Average sand thickness (ft.)	60
Estimated average porosity, %	20
Approximate gross production, start to January 1, 1942 (bbl.)	3,549,000
Productive acres	540
Average gross barrels per productive acre	6,572
Approximate future total gross oil reserve under normal operation (bbl.)	354,000
Approximate future gross oil reserve per acre under normal operation (bbl.)	540
Estimated future total gross oil reserve by water flood	2,700,000
Estimated future gross oil reserve per acre by water flood	5,000
Increase in gross oil reserve per acre by water flood	4,360

Isopach map of drillers' logs.—The average sand thickness of 60 ft. shown in Table 1 was determined from an isopach map of the property that was prepared while using old drillers' well logs. Although the isopach map represented the reservoir as it was originally developed, subsequent drilling and coring of input wells throughout the lease prove definitely that the productive sand consists of only about 50 per cent of the total section drilled as being productive.

General layout of project.—When all of the available production and reservoir data were considered, it was evident that the leases should respond satisfactorily to water flooding, and warranted further study. Consequently, a general layout of the entire program was developed. The water input and supply wells were located on the lease map with their respective surface elevations. Grades for all the distribution lines were laid out, and the size of all pipe and equipment was determined for the project, after which complete estimates of costs were prepared for use in evaluating the economics of the project.

Unitization.—The producing properties included in Lease A were originally operated as seven different leases. For maximum efficiency of the water flood and highest possible ultimate recovery of oil, to be obtained at minimum development and operating costs for the individual companies, the seven leases were unitized into one. The unit operating agreement provides that the project is to be operated by one of the companies in the unit, with all of the companies participating in all matters of the project on the basis of a fixed interest factor. The data that were used to determine the interest factor for each of the individual companies are as follows:

TABLE 2—INTEREST FACTORS FOR LEASE "A" (MAGNOLIA PETROLEUM CO. ET AL)

	Producing wells		Developed acreage		Gross cumulative production		Six mos. production, bbl.		
	No.	Int. fact.	Acres	Int. fact.	Bbl. to 6-1-42	Int. fact.	Ending 6-1-42	Int. fact.	Avg. interest factor, %
Company "A"	7	.1272727	80	.1454546	383,412	.1080303	991	.0831655	11.598
Company "B"	8		80		581,993		2,211		
	2		20		56,180		330		
Total	10	.1818182	100	.1818181	638,173	.1798119	2,541	.2132426	18.917
Company "C"	2		20		164,724		418		
	8		80		529,421		1,608		
Total	10	.1818182	100	.1818181	694,145	.1955826	2,026	.1700235	18.231
Company "D"	2	.0363637	20	.0363637	164,724	.0464126	418	.0350790	3.856
Company "E"	4	.0727273	40	.0727273	331,297	.0933464	1,171	.0982712	8.427
Company "F"	15	.2727272	130	.2363636	875,867	.2467846	3,828	.3212487	26.928
Company "G"	7	.1272727	80	.1454546	461,497	.1306316	941	.0789695	12.043
Grand total	55	1.0000000	550	1.0000000	3,549,115	1.0000000	11,916	1.0000000	100.000

1. Total wells producing at time of unitization.
2. Productive acreage.
3. Accumulative oil production.
4. Current production as reflected by a recent 6-month producing period.

Each of the four bases contributed equally to determine the average interest factor for each of the participating companies. Table 2 indicates the method used to determine the interest factor for each class of data as well as the average interest factor for the individual companies.

Development of Project

Core analysis. — After completing the unitization program for Lease A, which consisted of 540 productive acres, the development of the pilot water flood was started. This consisted of only 60 productive acres. There were six water input wells—spaced one well to 10 acres—and one oil well to 10 acres in the center of each of the two five spots. Since the lease was already drilled up with one oil well to 10 acres, this consisted of the drilling of five input wells and the converting of one old oil-producing well to a water-input well.

Each of the five water input wells drilled was cored—Wells Nos. 1, 2, and 5 with rotary tools, and Wells Nos. 3 and 4 with cable tools. The drilling and coring program of the five input wells included the use of various types of drilling muds in an effort to determine whether or not flushing of cores with the drilling fluid could be eliminated. Data developed from the coring program is included in Table 3 and indicates:

1. All rotary cores regardless of the type mud used were flushed with water from the drilling fluid.
2. Extremely low water loss muds (0.5 to 4 cc.) reduced the extent of flushing because the residual oil of the cores was higher than found in cores taken with high water loss mud.
3. Cable-tool cores taken with low-water-loss mud (0.5 cc.) was flushed more than rotary cores taken with same type drilling fluid.
4. Cable-tool cores taken with oil, although they were flushed with oil, indicated a normal water content in the reservoir.
5. Cable-tool cores taken with oil were flushed more than those taken with low water loss mud.
6. It is necessary to use both rotary tools with a low water loss mud and cable tools with oil to obtain sufficient and satisfactory core data to evaluate such oil producing reservoirs.
7. The primary oil production from the area within which the Lease A pilot flood is located should be equivalent to about 19.6 per cent of the total void space in the reservoir.

TABLE 3—CORE-ANALYSIS DATA—WELLS DRILLED FOR PILOT FLOOD ON LEASE "A" (MAGNOLIA PETROLEUM CO. ET AL)

	Well 1	Well 2	Well 3	Well 4	Well 5	Average
Depth	1,961-2,014	1,945-75	1,965-83	1,954-89	1,927-70	...
Per cent core recovery	89.0	86.0	100.0	88.7	90.0	90 7
Feet of permeable productive sand recovered	42.0	25.8	17.0	34.8	43.3	32.5
Average permeability, md.	18.0	23.0	30.0	23.0	34.0	25.6
Capacity, average permeability times feet productive sand	756.0	593.0	510.0	800.0	1,472.0	826.2
Average porosity, per cent	18.6	18.3	21.0	19.7	19.0	19.3
Average residual oil saturation, per cent pore space	21.1	26.6	18.5	66.2	26.7	31.8
Gravity of oil, °A.P.I.	42.0	42.0	42.0	42.0	42.0	42.0
Average total water saturation, per cent pore space	54.8	53.3	61.9	21.6	52.3	48.8
Viscosity, cp.	2.7	22.5	2.8	2.7	2.7	2.7
Drilled with	Rotary	Rotary	Cable tools	Cable tools	Rotary	...
Type drilling fluid	Mud	Mud	Mud	Oil from reservoir	Mud	...
Weight, lb. per gal.	10.0	9.8	9.8		9.8	...
Funnel viscosity, seconds	55.0	45.0	45.0	...	55	...
Water loss cc./30 minutes	30	Less than .6	Less than .5	...	4	...
Initial gel, grams	50	10	10	...	10	...

Evaluation calculations. — To estimate what per cent of the original oil in place was represented by the past primary production, the average of all five core analyses was used to calculate total fluid content of the reservoir in the pilot flood area. The calculations used an average porosity of 19.3 per cent, 22 per cent connate water, and 18 per cent oil shrinkage, as shown in Table 3. It will be noted in Table 4 that the calculations estimated that the reservoir contained originally 32,275 bbl. of stock-tank oil per acre. The past primary production for the lease, within which the pilot flood is located, was 6,286 bbl.

TABLE 4

Estimated Water-Flood Recovery Calculations Using Core Analysis Data Five Wells in Pilot Flood Lease "A" (Magnolia Petroleum Co.)

	Bbl./acre
Total pore volume (32.5 ft. sand, 19.3 per cent porosity)	48,681
Water content (22 per cent)	10,710
Initial oil content	37,971
Oil shrinkage (15 per cent)	5,696
Initial stock tank oil in reservoir	32,275
Past production	6.286
Present oil in reservoir	25,989
Residual oil in reservoir after water flood (23.2 per cent)	8,809
Oil available for water flood	17,180
Water-flood production 50 per cent efficiency	8.590

per acre. Therefore, it is estimated that the past primary production was equivalent to 19.4 per cent of the original oil, which agrees very closely with the 19.6 per cent obtained from core-analysis data and calculations for Wells Nos. 3 and 4. Table 4 also indicates that the reservoir still contains about 17,000 bbl. of oil per acre that is available for water flooding.

Permeability profile of reservoir.— As the flood was developed through subsequent extensions of the original pilot flood, all water-input wells drilled were cored for analysis. A permeability profile of the entire reservoir was constructed. There was a fairly wide variation in the permeability, not only in each individual well but from well to well. Also, the profile, which might be considered comparable to an isopach map, did not resemble the isopach map prepared from old drillers' logs. Instead of having 60 ft. of productive sand as shown by the latter, the producing reservoir has only about 30 ft. of permeable productive sand.

The profile of the permeability of the reservoir will be used throughout the producing life of the project along with other data to control water injection and production of both oil and water. It also serves to indicate the relative permeability of each well and thereby provides a means of estimating oil recovery from the project.

Operations

The water supply is obtained from 1,100-ft. salt-water producing wells. The wells were drilled with rotary tools to total depth, where 8-in. cas-

ing was set on top of the sand. The first three water-supply wells were spaced on regular 10-acre locations. It was observed when the third supply well was put in service that the producing capacity of the other two wells (1,000 bbl. per day per well) was effected. Therefore the spacing of water supply wells was increased to one well to 40 acres. The supply wells are equipped with 4-in. tubing and rods and 20-hp. pumping units.

The salt water is pumped through a separator and directly into the distribution lines to the input wells. The distribution lines include 6, 4, and 2-in. steel pipe. The water-input-well tubing heads include a manifold with suitable valves and meters to regulate the rate of water input; while the 2½-in. cement-lined tubing is set in the well on a packer in the bottom joint of the 5½-in. casing.

Production tests.—The performance of a water flood is usually followed during its producing life by periodic production tests on individual oil-producing wells. The production test data are used along with water-input data to indicate: (1) past water-flood production, (2) future oil production, and (3) whether or not the producing capacity of the wells is comparable to the volume of water being injected into the reservoir and determining thereby which water-input wells, if any, are losing water to sources other than the producing reservoir.

Periodic production tests and water-input data for the Lease A pilot water flood are shown in Fig. 1. It is estimated while using Fig. 1 that the pilot flood of Lease A has produced as of December 31, 1946, about 88,000 bbl. of oil—4,400 bbl. per acre or 133 bbl. per acre-foot. Also, it is estimated that the future life of the pilot flood will be approximately 5 years and should produce an additional 24,700 bbl. of oil, resulting in a total of 112,900 bbl. of oil for the 20-acre pilot flood—5,600 bbl. per acre or 170 bbl. per acre-foot, which agrees favorably with the estimate of 5,000 bbl. per acre and the past primary production shown in Table 1.

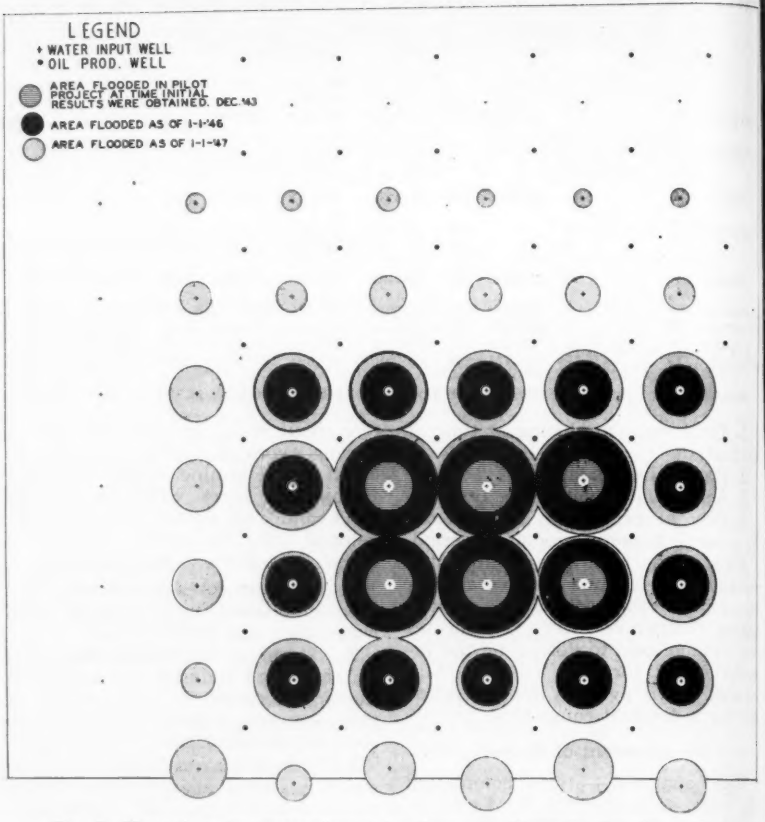

LEGEND
+ WATER INPUT WELL
• OIL PROD. WELL
AREA FLOODED IN PILOT PROJECT AT TIME INITIAL RESULTS WERE OBTAINED. DEC. '43
AREA FLOODED AS OF 1-1-'46
AREA FLOODED AS OF 1-1-'47

Fig. 2—Map of water encroachment for Lease A, Magnolia Petroleum Co.

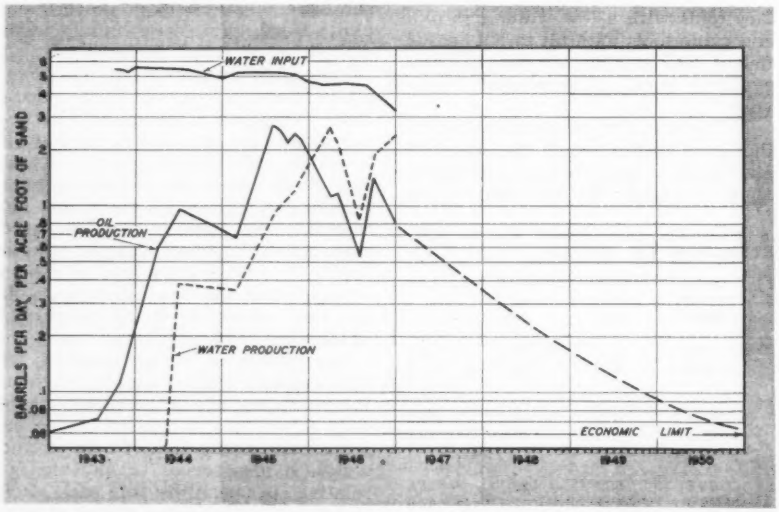


Fig. 1—Production and water-input data for Lease A—pilot flood. Estimated production, December 31, 88,200 bbl.; estimated recovery per acre, December 3, 4,400 bbl.; estimated recovery per acre foot, December 31, 133 bbl.; estimated future production, 24,700 bbl.; estimated total production, 20 acres, 112,900 bbl.; estimated recovery per acre, 3,600 bbl.; estimated total recovery per acre foot, 170 bbl. Water input per acre foot, December, 0.3310 bbl.; oil production per acre foot, December, 0.0838 bbl.; water production per acre foot, December, 0.2150 bbl. Total, 0.2988 bbl.

Injection Rate

It will be observed (Fig. 1) that the rate water was being injected early in the life of the project was about 0.5 bbl. per acre-foot per day (5 bbl. per foot of permeable productive sand) and the rate gradually declined, especially after January 1, 1946. The maximum rate of 5 bbl. of water per foot of sand was considered ample to maintain the proper velocity for the water to move through the sand. A higher rate of injection of water would obtain results quicker, but such rates would create conditions that would cause the water to bypass some of the oil in the low permeable streaks in the sand. Likewise the total fluid of the periodic production tests were increasing until January 1, 1946, at which time they began to level off and approach the volume of water being injected into the pilot flood. During December 1946, the two oil-producing wells in the pilot flood produced a total of 0.298 bbl. of fluid per acre-foot per day as compared to 0.331 bbl. of water injected

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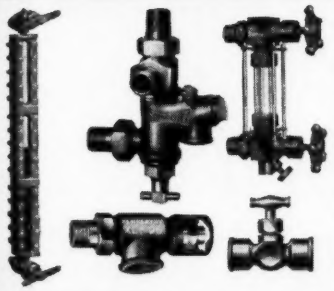

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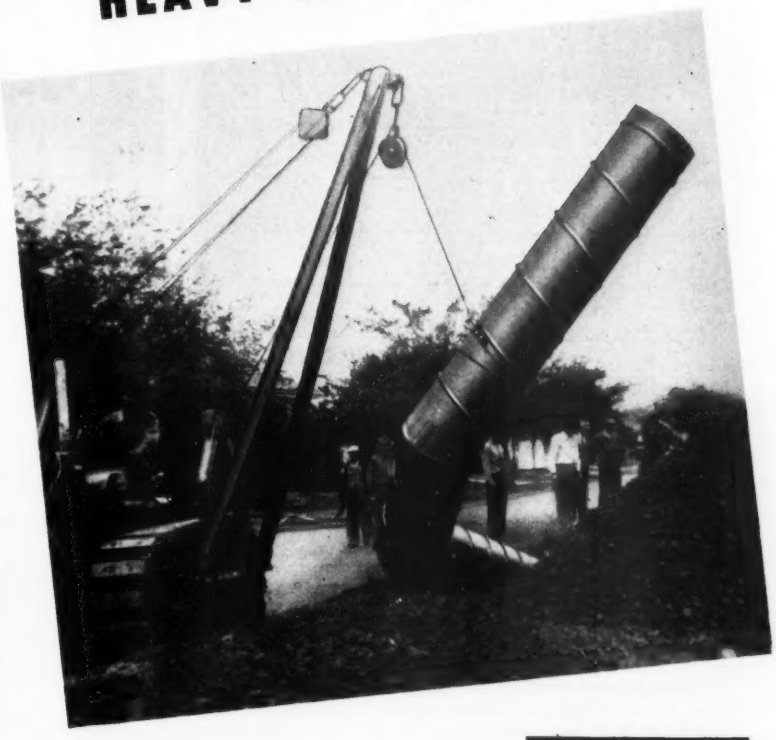

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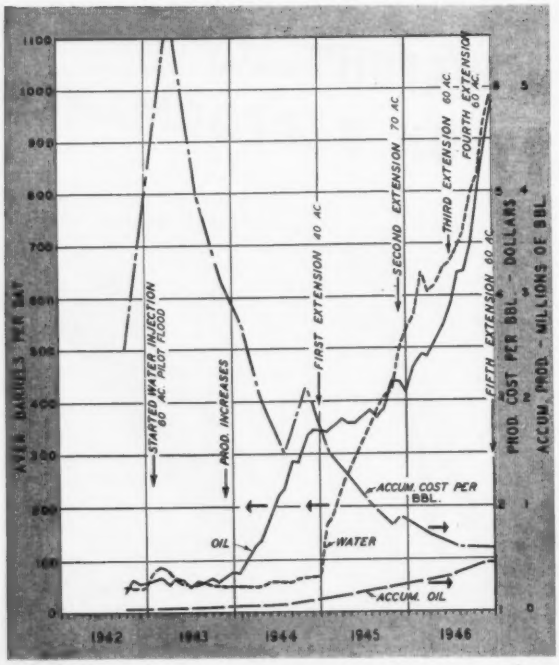


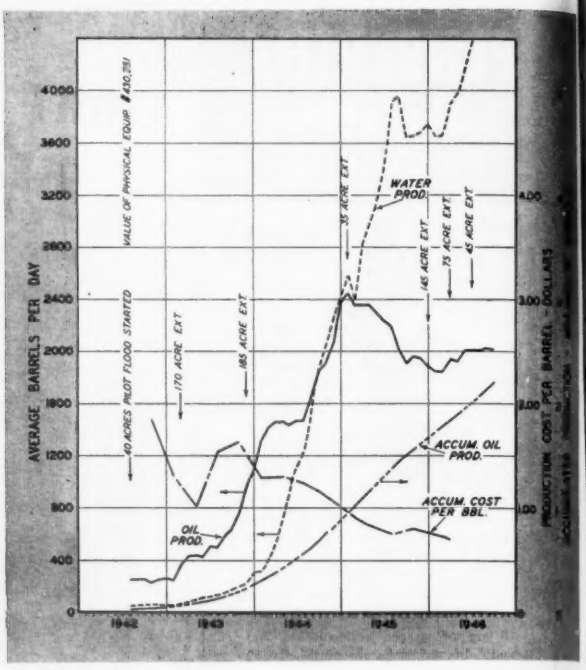


Fig. 3—(Left) Operations data for Lease A, Magnolia Petroleum Co. Fig. 4—(Right) Operations data for Lease B, Magnolia Petroleum Co.

per acre-foot per day, which indicates that the pilot flood is in balance, in that the production of fluid is equivalent to the volume of water that is injected into the reservoir.

Water encroachment.—The flood on Lease A is being developed relatively slowly by injecting water at a slow rate, and it is important to observe the water encroachment throughout the lease. Fig. 2 was developed to estimate how much of the reservoir at subsequent periods of time had been filled with water. The six original pilot flood input wells, W-14, W-15, W-18, W-19, W-30, and W-31, are located in the southwest quarter of the present developed acreage of the lease. The inner circle of the six pilot input wells (Fig. 2) represents the surface area around each well under which the reservoir was filled with water at the date (December 1943) results from increased oil production was observed. The first 140-acre extension, which includes 14 water-input wells immediately around the pilot water flood, was put in operation about 2 years after the pilot water flood was started. The inside circle of the first extension input wells and the middle circles of the six pilot flood input wells represent the surface area under which the reservoir has been filled with water as of January 1, 1946. The outer circles of the six pilot input wells, as well as the wells in the first extension and the single circles for all of the other wells shown as being in water-flood service, represent the surface area under which the reservoir is filled with water on January 1, 1947.

Fig. 2 indicates two important things in the operation of the water flood:

1. The area represented by the inside circles on the six input wells indicates approximately the volume of water necessary to be injected into the reservoir before results are obtained, and thereby the date to expect increased oil production from all subsequent extensions in the project can be estimated.

2. It indicates definitely that the flood is out of balance and emphasizes the necessity of starting the injection of water into all of the water-input wells, as near as possible, on the same date.

The area filled with water within the pilot flood of Lease A, at the time results were obtained, was equivalent to 21.6 per cent of the volume in the reservoir included within the boundary of the six water input wells. A similar map for the pilot flood on Lease B indicated that sufficient water had been injected at the time results were observed, to fill 56 per cent of the reservoir included within the boundary of the four water input wells. Likewise a similar map for a Lease C indicated that only 18.6 of the reservoir was filled with water at the time results were apparent.

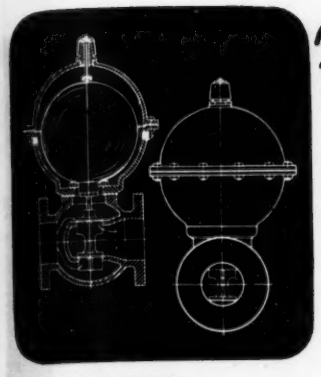
Spacing

Lease A was operated on a 10-acre spacing while injecting at about 5 bbl. of water per foot of sand. Lease C is on a 20-acre spacing while injecting at about 3.5 bbl. of water per foot of sand. Lease B is on a 10-acre spacing while injecting water at a higher rate and as much as 10 bbl. of water or more per foot of sand. Although the three floods are not completed, the data do indicate that the wider spacing and slower rate of injection will obtain results with smaller volumes of water injected and thereby produce more oil per barrel of water injected.

Production history.—The development of the pilot water flood on Lease A (Fig. 3) was started in October 1942. It was developed relatively slowly in that 420 acres of the 540-acre unit were developed over a period of 4 years. Injection of water into the six pilot water-flood input wells was started in January 1943. The water was injected into the six input wells at about 5 bbl. of water per foot of permeable productive sand per day per well and was continued at this rate until December 1943, at which time evidence of increased oil production was observed. In October 1944, the production had increased from 52 bbl. per day from 54 wells to about 350 bbl. of oil per day, at which time the first extension, consisting of 140 acres completely surrounding the pilot water flood, was put into operation.

Production Continued to Increase

Oil production continued to increase until October 1945, to about 440 bbl. per day, at which time the second extension, consisting of 70 acres along the south and west edge of the developed flood, was placed under operation. During 1946, the third extension of 60 acres, the fourth extension of 60 acres, and the fifth extension of 50 acres was developed. As of Janu-



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ary 1, 1947, the daily production of oil was 990 bbl. of oil per day, while the water-oil ratio of 1 to 1 is about the same as it was when pilot flood was started. At the present time, the lease is producing a little less than 1,100 bbl. of oil per day. With subsequent extensions, which are in the process of being made, production of oil should reach 1,800 to 2,000 bbl. per day in about 6 months.

It is of interest to observe that Lease B (Fig. 4), which is comparable to Lease A, was put under flood about the same time. The Lease B flood was developed at a faster rate, in that a total of 395 acres was developed in less than 18 months. The daily production of oil and water, after attaining the initial increase in oil production in about 6 months after starting the water injection, increased rapidly and reached a peak of approximately 2,400 bbl. of oil per day, while producing a water-oil ratio of 3 to 1.

Comparing the operation of the above two leases, it is evident that a rapid development of a project is possible, and the payout of the operating expense and development cost would occur in a shorter period of time. Lease B, along with being developed rapidly, used a relatively high rate of water injection initially (10 bbl. per permeable productive foot of sand per day per well), which also effected the rate of increase of oil production.

Use of Wider Spacing

Also for comparison, with the exceptions of the well spacing and the rate of injecting water, Lease C (Fig. 5) is comparable to Lease A and Lease B. Lease C is developed on a 20-acre spacing and utilized an injection rate of about 3½ bbl. of water per foot of permeable productive sand per day per well. Fig. 5 indicates that water was injected for about 2 years before evidence of increased oil production was observed, and there has been no increase in water production.

The use of wider spacing and slower rates of injection of water on Lease C has resulted in slower response to water flooding and the rate the oil production increases is slower than in the case of Lease A or B. Also, it is noted that the Lease B, while being flooded at a high rate of injection, has increased in water production faster than either Lease A or B.

Costs.—The water-input well spacing pattern for Lease A was on a 10-acre spacing. All of the water-input wells were drilled and with the exception of one well, the oil-producing wells were old wells that were drilled originally on the lease. The development cost for the project, as of January 1, 1946, has been about $1,450 per acre. Production cost per barrel of oil, as of the same date, has been

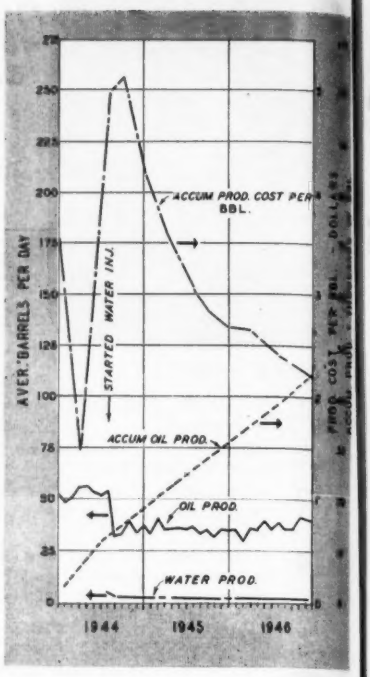

Fig. 5—Operations data for Lease C, Magnolia Petroleum Co.

about 40 cents per barrel. In Fig. 3, the accumulated total cost per barrel for Lease A is indicated, and at the present time it is about $1.60 per barrel. It is significant to note that the lease has produced only about 500,000 bbl. of oil, as of January 1, 1947, and it is estimated that it should produce 2,700,000 bbl. Therefore, the project should produce an additional 2,000,000 bbl. of oil during the next 5 or 6 years, resulting in relatively low over-all production and development cost per barrel of oil.

Development Cost

In Fig. 4, production data and the accumulated total cost per barrel are shown for Lease B. Development cost per acre on Lease B is comparable to Lease A and at the present time, under the higher rate of development of project and injection of water, the over-all cost is about 70 cents per barrel.

In Fig. 5, the accumulated cost per barrel is indicated for Lease C and is much higher in that the total oil production is low because the flood has not been operating long enough to obtain major results from the water flood. The development cost for Lease C has been about $400 per acre, as the result of using a wider well spacing and some of the old oil wells for water-input wells. The production cost per barrel on Lease C likewise is relatively high at this time. However, it is apparent that such costs will be reduced rapidly when the oil production is increased by the flood.

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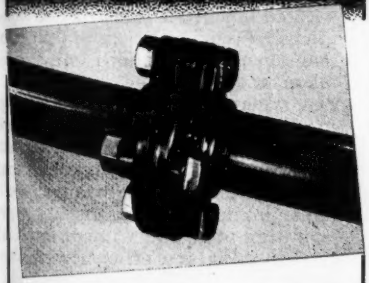

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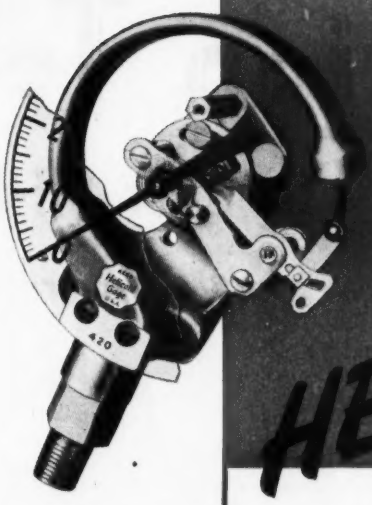

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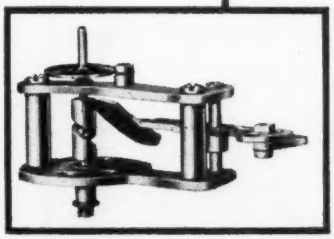

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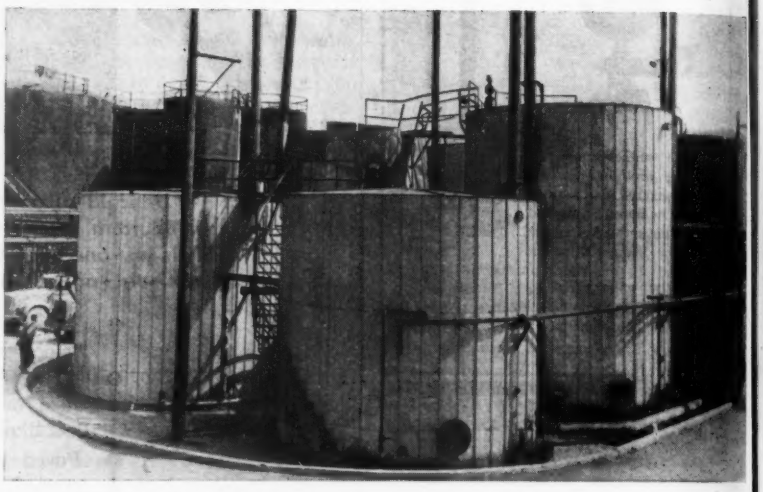
Insulation Technique

For Oil-Refinery Structures

by S. S. Parker*

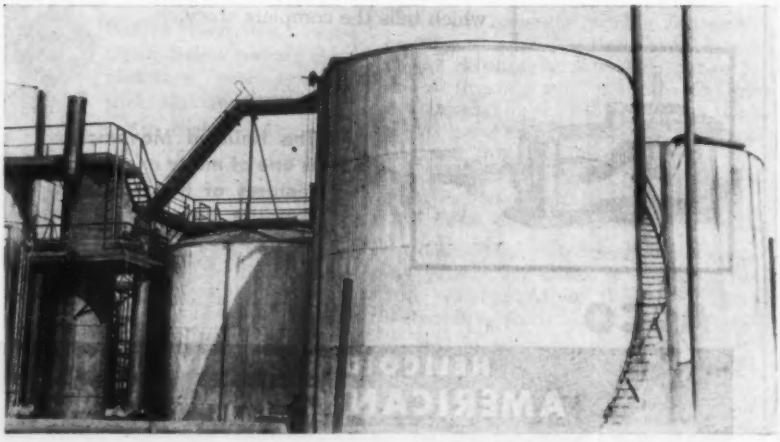
TO be of optimum value, insulation for refinery equipment must possess a combination of characteristics. Obviously, to be effective, an insulating material must have a low "k" factor, to minimize heat transmission. Of nearly as great significance, in applying insulation to such large irregular surfaces, is the ease with which it may be applied to conform closely to the surfaces. Initial efficiency of any insulation is of small significance unless the installed material retains its initial properties over long periods of time in unfavorable environments. The ease with which insulation may be protected from moisture, vibration, corrosive fumes, and other harmful influences, and the facility with which the insulation lends itself to ready maintenance, are fundamental to successful application and long-range operating value.

Application methods vary from refinery to refinery, each having greater or lesser success with various insulating materials. According to Ashland Oil & Refining Co., Ashland, Ky., great success, over a 10-year period, has been obtained from the artificial silicate fibers which in their various forms are grouped generally as mineral wool. The specific advantages and experiences which Ashland has found through the use of the mineral-wool materials, should be interesting to all petroleum and chemical industrial consumers of insulation.



This recently built group of road-oil-mixing tanks is insulated with 2 in. of blanket mineral wool between the tank wall and an outer moisture-sealing sheet-metal shell

Compared with some forms of insulation, the blanket form materially decreases the time and expense of application. In addition it has lower unit area costs for equivalent insulating value. Maintenance operations may be readily performed by removing unit panels of backed-blanket mineral wool, without disturbing adjacent insulation, and may be immediately replaced, with the same insulating value as originally possessed, without extensive construction operations. Frequently, quite extensive maintenance operations are undertaken and completed in less than a day, where, with ordinary brick-type insulation, several days or weeks would be required to scaffold, cut, fit, and lay. This rapidity of repair operation permits the maintenance of minor matters without shutting down operating units and without materially disturbing the efficiency of operation.



Asphalt oxidizing tanks at Ashland Oil & Refining Co. Noxious vapors from the operation are passed through the fume absorbing towers visible in the left side of photograph

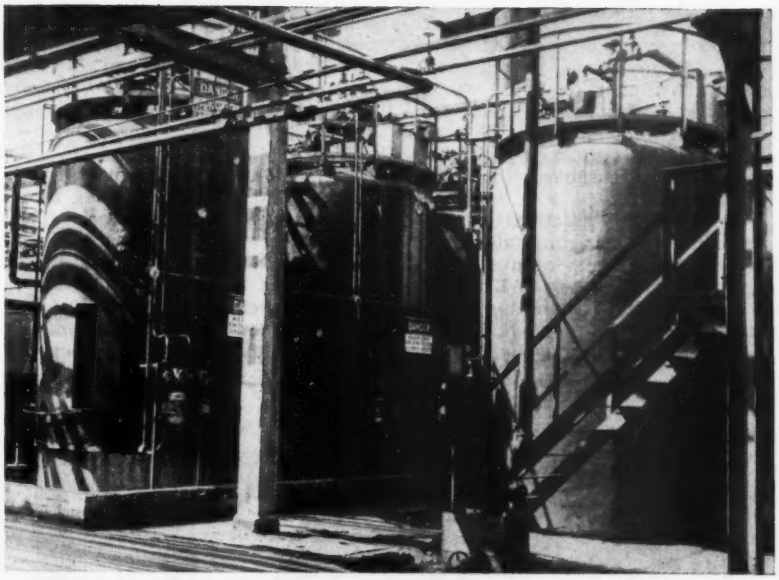
Advantages of Mineral Wool

Ease of first application, as well as ease of maintenance, would be of no real value if insulation had to be subjected to constant attention to keep it in good condition. Experience has shown Ashland that mineral-wool blankets, properly applied, have the ability to retain both structure and thermal coefficients in service. Freedom from packing, sifting, powdering, cracking, and other defects so frequently encountered with some insulating mediums commonly used in refinery practice, eliminates expensive insulation maintenance and repair, and insures continuous opera-

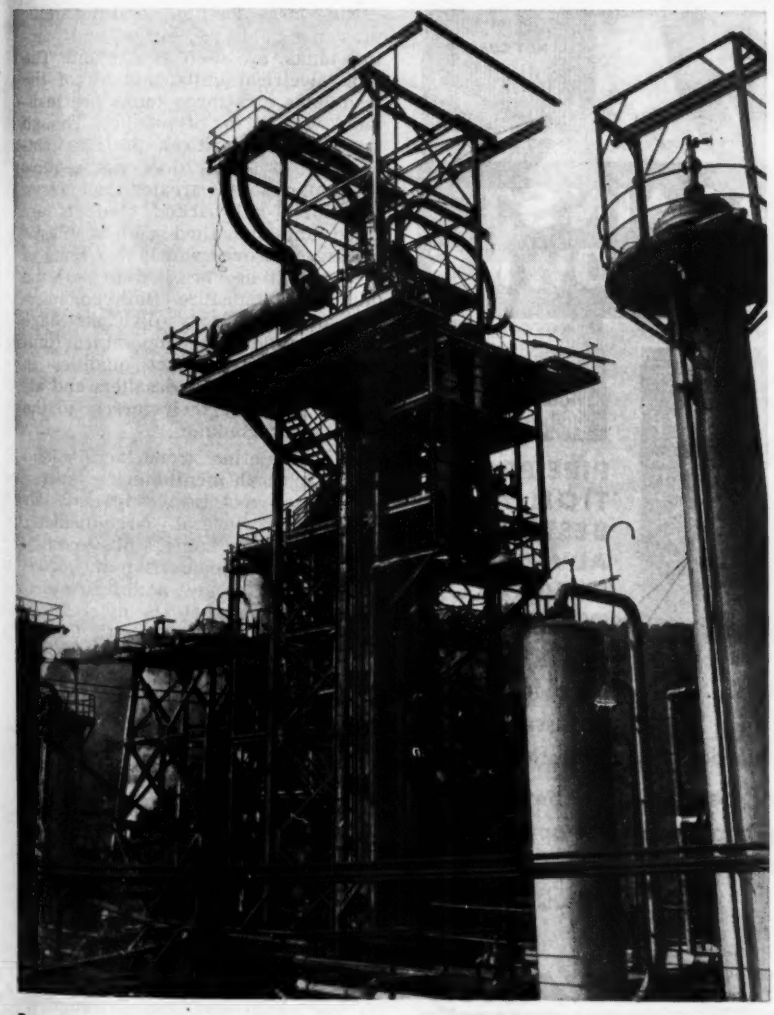
*Design engineer, Ashland Refining Co.

tion under controlled conditions for long periods of time. The ability to operate and maintain equipment without interruption of function is obviously most important in the economics of refinery management.

Asphalt oxidizing at Ashland's refinery is performed in four tanks, two with 1,500 and two with 5,000 bbl. capacity. These oxidizers are insulated with 2 in. of blanket mineral wool which is supported between a chicken-wire mesh (in contact with the ¼-in. steel plate inner tank) and expanded metal lath outside. The blankets are held in place by heavy wires which were butt welded to the steel plate prior to application of the insulation. The wires pierce the blanket and their ends are securely clinched to the lath backing. All joints of adjacent blankets are securely wired together at the lath edges. Weather protection and moisture sealing are simultaneously obtained by the application of a corrugated galvanized sheet metal outer shell. Riveted seams of the 20-gage galvanized iron prevent penetration of water or other harmful atmosphere constituents and make a strong outer structure.



This battery of electric field precipitators is insulated with 2 in. of blanket mineral wool. A plastic sealing coat and two outer coats of brushed asphalt protect the insulation



Four inches of blanket mineral wool in two staggered layers effectively control stage temperature variations of approximately 325° F. along the height of this six-fraction unit

Exhaust gases and smothering steam from the asphalt tanks are withdrawn and passed through two fume-absorbing towers. Coke is used in these towers to absorb the noxious, corrosive waste gases for health protection and the remaining non-condensed steam is allowed to vent to the atmosphere. The use of insulation on these units yields additional advantages, beyond reduced fuel consumption and protection against temperature variations. The optimum oxidizing temperature can be held constant, giving the oxidation cycle more opportunity to convert the bases, and thus materially reduce cycle time.

Mixing and Blending Tanks

Road-oil mixing and blending tanks are another volume heating operation in which Ashland has found blanket insulation particularly effective and easy to apply. At present five units are in operation, two 1,000 and three 1,500-bbl. vessels. The construction of these tanks is quite similar to that employed in the asphalt processors. Two inches of mineral wool blanket is used, applied identically as in the insulation of the above units, except that, in the absence of corrugated galvanized iron, 20-gage flat roofing sheet was used with edges raised and rib-crimped between adjacent sheets. Such assembly provides both weather sealing and stiffening. In all of these process tanks the heat control is so effective that the external tank surface is only moderately warm to the touch. Around 90° to 100° F. (when the ambient temperature is 70° F.) is the usual range.

The primary purposes of heat con-

servation and uniformity of temperature throughout the tank are effectively accomplished. Furthermore, when enlargement of units, or removal and re-erection is called for, the mineral-wool blankets are easily removed, in such a manner that they are completely reusable without loss of effectiveness.

A new vacuum fractionating column built in 1942 is run under 28-in. Hg. vacuum at temperatures which range, approximately, from 725° F. at the base to 400° F. at the top of the unit. The tower was covered with two layers of mineral wool blanket, each two inches thick, faced with wire mesh, backed with metal lath. Each layer was securely wired and clamped in place, and the seams of the two layers were staggered to prevent through joints which might have low insulating value. In this case the exterior metal lath was smoothly filled and coated with plastic sealing compound troweled into the lath. The entire surface was then hot mopped with two coats of asphalt mastic, to complete the weather seal.

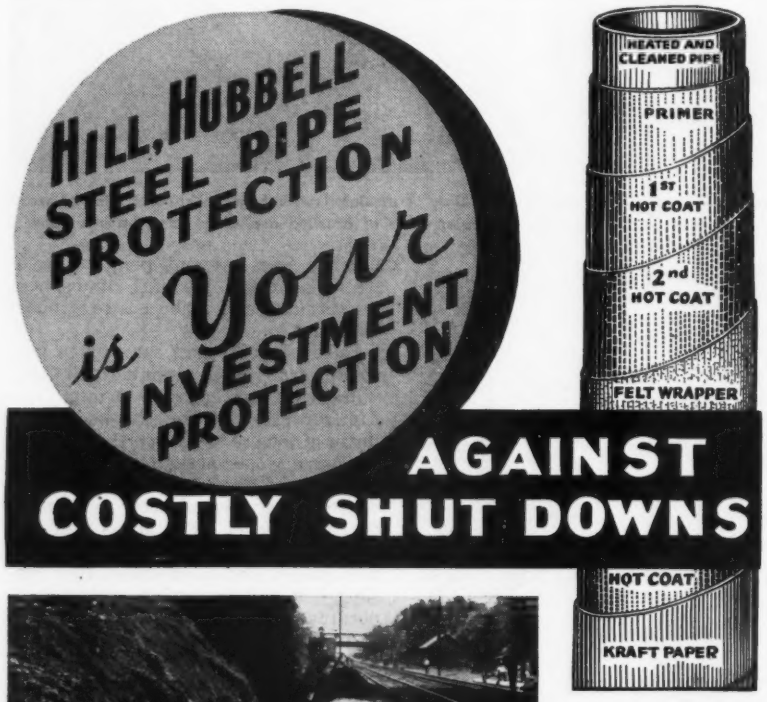
In constructing large units, with multiple layers of insulation, it is most important that the insulation be applied while dry, and be protected from water until the weather seal is complete. Water-soaked insulation is a good conductor of heat. When effectively vapor proofed, any water which may be trapped in the insulation before vapor proofing can remain for extended periods, and when converted to steam, it can seriously rupture the weather-sealing coats in its escape.

Though silicate wools are not subject to rot or other disintegration due to the action of water, their efficiency is greatly reduced if the air voids within the insulation fill with water, and the damage to equipment can be severe over extended times. The singular absence of cracking, sagging, and other mechanical weaknesses which is inherent in mineral-wool blankets affords a wide margin of safety against failure. When applied dry and properly, mineral-wool-blanket insulation has an indefinite life. Units at Ashland which have been in operation for more than 10 years are still effectively insulated and protected.

Nine large 200-bbl. desalting units, plus auxiliary surge and control tanks, are used at Ashland. The nine electrical units, and all of the feed lines and surge tanks are insulated with 2 in. of blanket. Though the control is critical, the low temperature, 200° F., does not require the application of greater thicknesses. The metal-lath-backed blankets are filled and smoothed with a plastic sealing coat over which two coats of hot asphalt are brushed to seal the units from moisture. Both engineering and laboratory divisions have closely followed temperature uniformities and product qualities in connection with the desalters and attribute much of their success to the insulation technique.

One insulation trend at Ashland which is worth mentioning is the use of mineral-wool insulating materials on piping. Several large-diameter steam lines are being built, to carry high-pressure steam from the original plant to a new addition, a distance of more than ½ mile. These lines will be protected with formed blanket mineral wool. Experience at this refinery has indicated that losses will be between 10° and 15° F. in steam being transported at 225 psi. at 550° F.

The technical characteristics Ashland has found important in insulating materials over the past 10 years include: (1) ease of application and of maintenance; (2) freedom from rot and chemical disintegration; (3) freedom from mechanical failures due to powdering, dusting and cracking; (4) the ability to encase, vapor seal, and moisture-proof after application; (5) freedom from danger of combustion; (6) low initial cost, and (7) complete salvageability—all in addition to low thermal conductivity factors.



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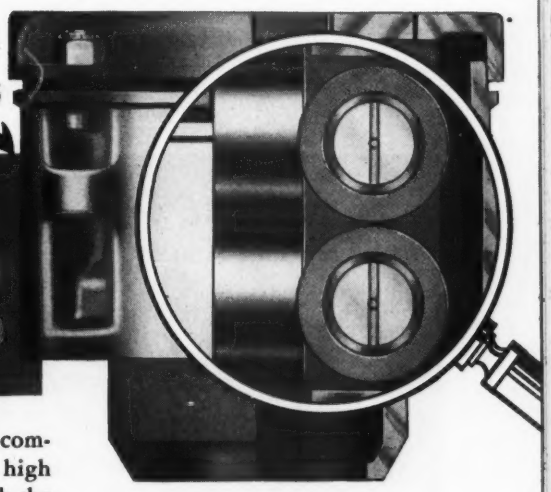

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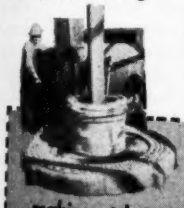
IF you want to know whether or not your rig operations are completely up-to-date *look at your kelly bushing.* If, under modern high speed drilling operations, you are still trying to *slide* the kelly through the bushing instead of *roll* it through, you're bucking the same kind of friction you'd get by dragging a load of drill pipe instead of rolling it on wheels.

Here's why: Some operators think that, because the drill string is hanging vertically in the rig, it will drop through the table without friction when the weight is fed off. It will—*as long as no driving pressure is being applied by the rotary table.* But as soon as the table starts rotating the drill string, pressure is built up between the bushing and kelly... pressure that becomes greater and greater as table speeds and the length of the drill string increase.

This driving pressure becomes so great under today's high speed drilling operations that the kelly simply cannot feed off freely when the brake is lifted. Bit feed becomes jerky and erratic. Too much weight is applied... the bit "digs in"... and the damaging torsional loads set up in the drill string cause costly "twist-offs" and pin failures. In addition, table and swivel bearings are subjected to surging impact loads and the life of virtually every piece of equipment in the drill string is substantially shortened.



But—WITH A BAASH-ROSS ROLLER KELLY BUSHING the rollers insure instant response to kelly feed *regardless of driving pressure between bushing and kelly.* Instant response means accurate weight control... faster drilling... straighter hole... and minimum torsional loads to damage the drill string or rig equipment.

When you put a Baash-Ross Roller Kelly Bushing on your rig you can count on making at least 6 important savings...

1. **MORE ACCURATE WEIGHT CONTROL** because—even at table speeds as high as 1000 r.p.m.—there is no friction between bushing and kelly to hold up the drill string or prevent instant weight response.
2. **STRAIGHTER HOLE** because bit feed is controlled more accurately and excessive weight is eliminated.
3. **MORE HOLE PER BIT** because the bit can be kept digging at a more uniform and efficient rate without damaging load surges.
4. **REDUCED DRILLING COSTS** because longer bit life means more time on bottom, less time wasted on round trips.
5. **MINIMUM DRILL STRING DAMAGE** because sensitive roller kelly feed eliminates over-feeding and the sudden torsional loads that cause twist-offs and thread damage.
6. **MAXIMUM EQUIPMENT LIFE** because drilling lines, swivel and table bearings, and other rig equipment are all protected against the destructive impacts of over-feeding.

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Baash-Ross pioneered the roller kelly bushing principle and through the years has made one important design advancement after another that insures maximum service life and minimum maintenance on even the heaviest drilling service. • Two Rollers against *each* kelly face prevent wobble and gyration of the drill string • Replaceable Bronze Bushings between rollers and pins take practically all the wear • Reversible Pins can be rotated to double the life of the pins • Solid One Piece Cover is completely streamlined for maximum safety and strength • Positive Shim Adjustment in hex kelly bushings simplifies maintaining the proper clearance essential with hexagonal kellys... These and many other features mean maximum operating efficiency and long service life when you install a Baash-Ross Roller Kelly Bushing.

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Get all the facts from your Baash-Ross representative on the many savings you can make by installing a Baash-Ross Roller Kelly Bushing. Or write direct.

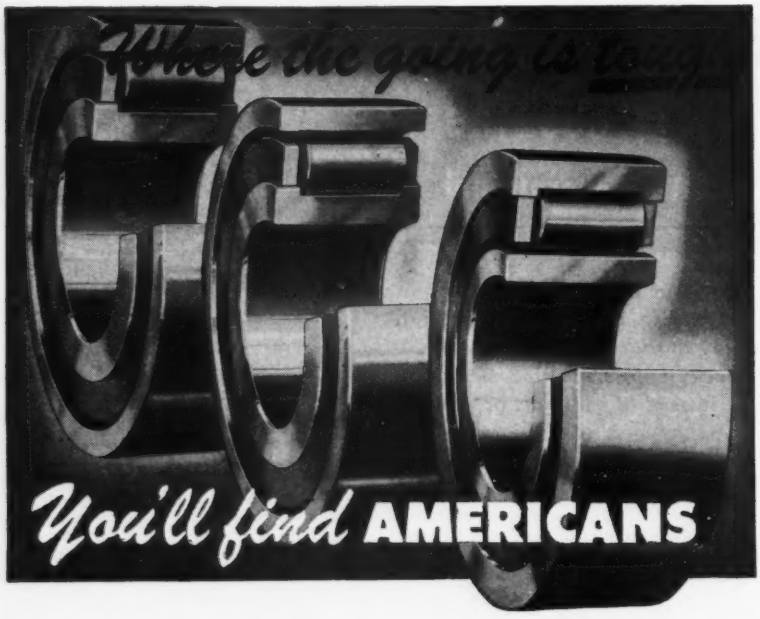
PROGRESS IN METALS

by W. L. Nelson

Consulting Engineer

Gas Carburizing

THE mechanism of carburization in solid and gaseous media is discussed with reference to the action on 0.15 per cent carbon case-hardening steel, 3 per cent nickel case-hardening steel, and nickel-chromium case-hardening steel. The carburizing properties of two types of atmospheres, namely, the hydrocarbon-rich type and that containing little or no hydrocarbon gas and approximating the atmosphere which is found in a pack carburizing box, were investigated.



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The hydrocarbon-containing gases have included town gas butane, and propane, and a study has been made of the effect of diluting these gases with inert or decarburizing agents for the purpose of reducing sooting of the work, while maintaining a high rate of carburization. The carburizing atmospheres not containing hydrocarbons were specially prepared in typical industrial controlled-atmosphere units. The carburizing temperature selected was, in the majority of tests, typical of industrial practice for the steel in question.

The degree of carburization was determined in a number of ways: (1) By measurement of the increase in weight of the steel per unit area of surface; (2) by chemical determination of the carbon content of the marginal layers of the carburized steel; (3) by metallographic estimation of the case depth; and (4) by depth-hardness measurements on the quench-hardened carburized steel.

Investigation of the carburizing properties of raw hydrocarbon gases such as town gases and butane has indicated that the ready deposition of soot from both gases interferes with the carburization reaction and, in extreme cases, can completely inhibit carburization. Town gas contains decarburizing gases which offset to a large extent the decarburizing constituents. The processing of town gas in order to eliminate the unsaturated hydrocarbons and the decarburizing gases results in an atmosphere being obtained which is strongly carburizing, although the tendency to sooting is not completely eliminated.

Diluting agents such as air and burned town gas call for high concentration of propane to offset the decarburizing gases present. To obtain anything approaching a maximum rate of carburization, propane contents above 25 per cent have to be considered, with the result that the tendency to sooting is considerably increased. It has not been found possible, when using either air or burned town gas as a diluting agent, to eliminate sooting and still to maintain the maximum carburizing rate.

A diluting agent which contains no decarburizing gases can be generated by the treatment of burned town gas over charcoal at approximately 1,000° C. Carbon dioxide and water vapor can be completely removed by reactions with the charcoal, and the resulting gas is itself carburizing. Concentrations of propane of the order of only about 2 per cent are sufficient to make the atmosphere very strongly carburizing, and because of the low concentration of the hydrocarbon gas a maximum rate of carburization without sooting can be obtained.

The carburizing properties of carbon - monoxide - hydrogen atmospheres, prepared from town gas, charcoal, or both, have also been in-

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vestigated. The atmosphere generated by the treatment of rich town gas air mixtures over charcoal maintained at a temperature sufficiently high to eliminate carbon dioxide and water vapor, has excellent carburizing properties.

The addition of a small concentration of propane safeguards against any trace of decarburizing gas that may remain in the generated atmosphere, and results in a maximum rate of carburization without sooting. As distinct from the diluted propane atmosphere, which tends to produce a hypereutectoid case with a deep cementitic network, the carbon-monoxide-hydrogen type of atmosphere produces a surface near to the eutectoid composition, with a case of rather less depth. However, the need for a diffusion period to remove the cementitic network is avoided.

The effect of the steel surface upon the rate of absorption of carbon by a steel has been investigated. Roughening the surface by heating the steel in an atmosphere in which intergas reactions are promoted by the steel markedly increases the activity of the surface and speeds up the rate of carburization.

For carburization to proceed at a satisfactory rate, it is necessary for the steel to be in a condition which readily absorbs the nascent carbon supplied to it at the surface. The foregoing experiments have shown that below the upper critical point for the steel, i.e., in the ferrite austenite phase, the rate of solution of carbon by the iron is comparatively slow. Gamma iron, on the other hand, dissolves carbon very readily, and the cementation process is invariably carried out above the upper critical point for the steel.

When a carbon steel is treated at a suitable high temperature in an atmosphere containing carbon monoxide, direct reaction may take place between this gas and the carbon in the steel.

If the carbon monoxide is in excess of that required for equilibrium in this reaction, the steel is carburized. Under certain conditions, however, it is also possible for the carbon monoxide to deposit on the steel surface free carbon which does not enter into solution in the iron.

In such a case an atmosphere which is balanced with respect to cementite in the steel contains excess of carbon monoxide with respect to equilibrium with solid carbon, and sooting may result from the progress of the producer-gas reaction to equilibrium. If the atmosphere is balanced with respect to reaction, however, decarburization of the steel will take place. An atmosphere having a composition intermediate between the two sets of equilibrium concentrations can therefore lead to both sooting and carburization.

Abstract: Ivor Jenkins, Iron and Steel Institute, June 1946, 21 pp. Taken from the October issue of Materials and Methods, p. 980.

* Bitumastic is the registered name of the pioneer product in this field—be sure to specify it by name. Substitute products will NOT give Bitumastic protection.

Lowering pipe into a ditch after a snowstorm on the Cities Service Chemical-Transportation Company's gas line between Hugoton, Kansas and Blackwell, Oklahoma

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PLANT corrosion tests reported by Lukens Steel Co. on the resistance of various metals or alloys to the action of chlorine, hydrochloric acid, and acetylene tetrachloride showed:

Material—	Corrosion rate, i.p.y.*
Monel	< 0.0001
Nickel	< 0.0001
Inconel	0.0001
Hastelloy A	0.0001
Hastelloy C	0.0005
Ni-Resist (type 5)	0.0007
Ni-Resist (type 1)	0.0011
1 Per cent Ni Cast Iron	0.0037

*Inches penetration per year.

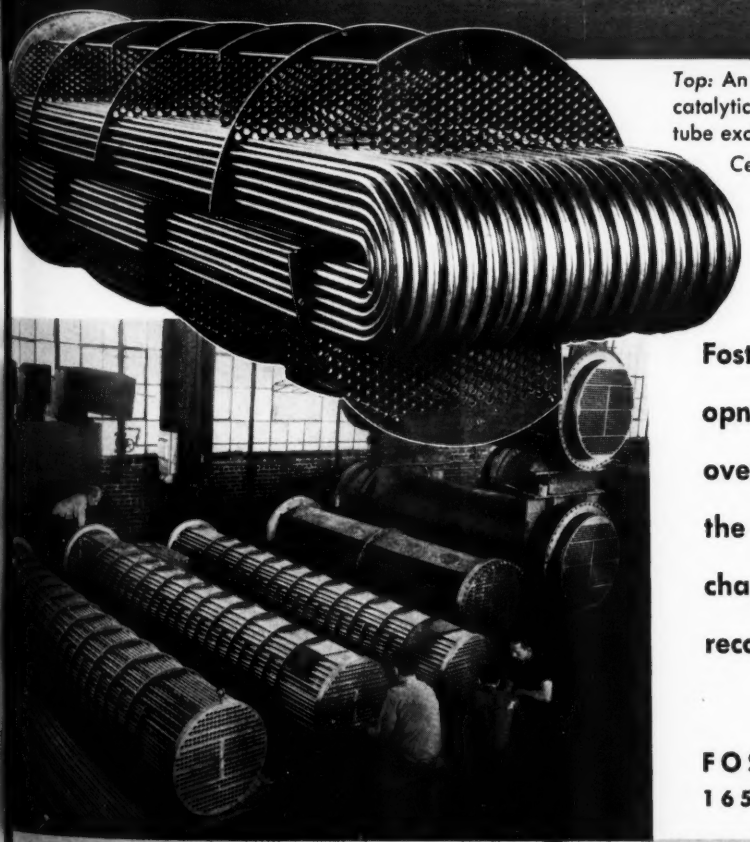
The conditions were: mixture of crude acetylene tetrachloride with 10 to 21 g. per liter excess chlorine and 0.15 to 1.65 g. per liter dissolved iron. Acidity (HCl) 0.7 to 6.6 g. per liter. Temperature 108°-120° F. (avg. 115° F.). Duration 282 days. Velocity approximately 0.5 ft. per second.

Metallurgical Terms

Work Hardness

When steel is mechanically worked at room temperature (cold working) an increase in hardness occurs which is referred to as work hardness. Little or no work hardness develops if the mechanical working is conducted at a high temperature (hot work).

refinery heat exchangers



Top: An 85-ton heat exchanger for service with a large fluid catalytic cracking unit. This is one of the largest shell and tube exchangers ever built for the petroleum refining industry.

Center: U-tube bundle assembly.

Bottom: Shop fabrication — tube expansion on completely assembled tube sheets.

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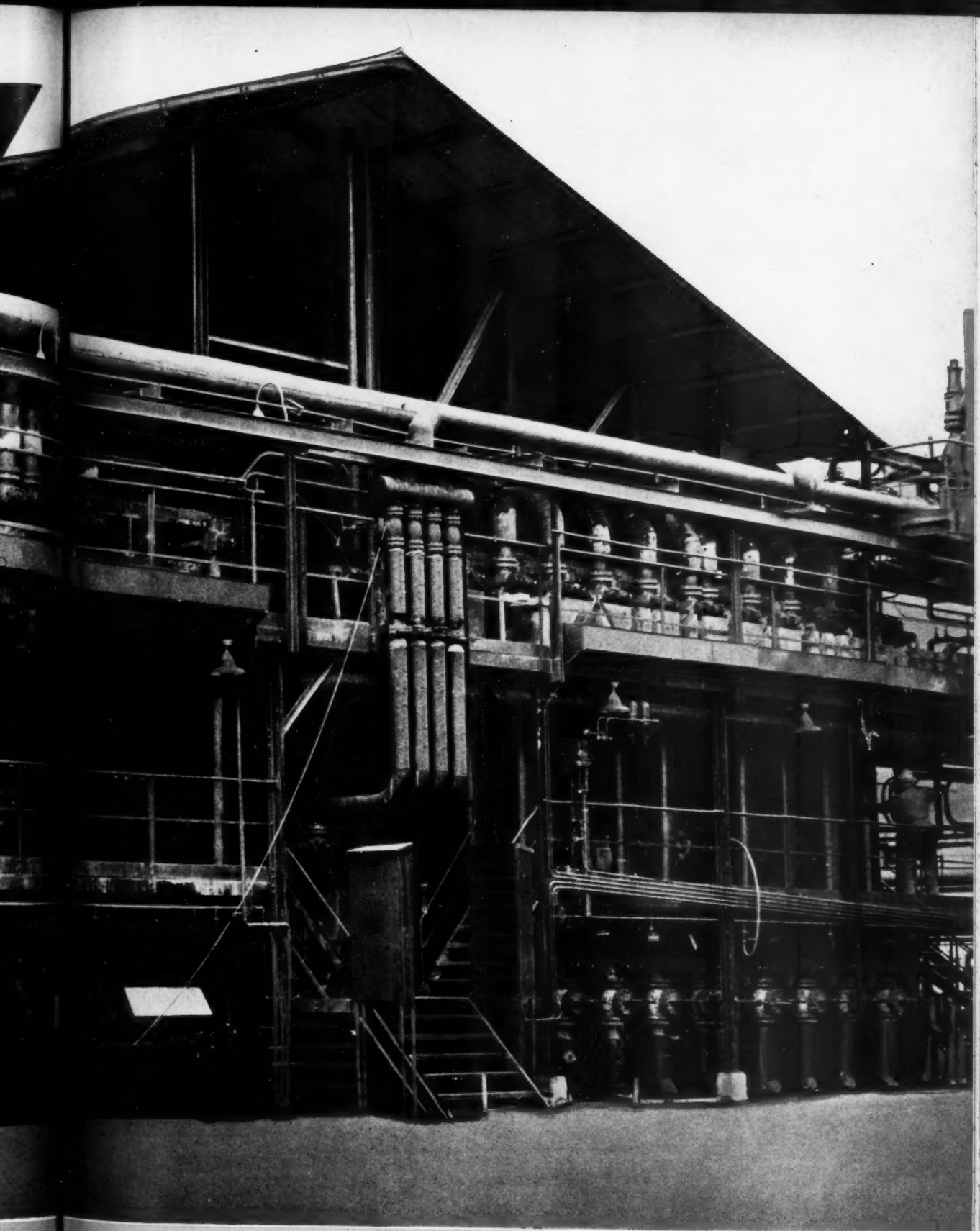

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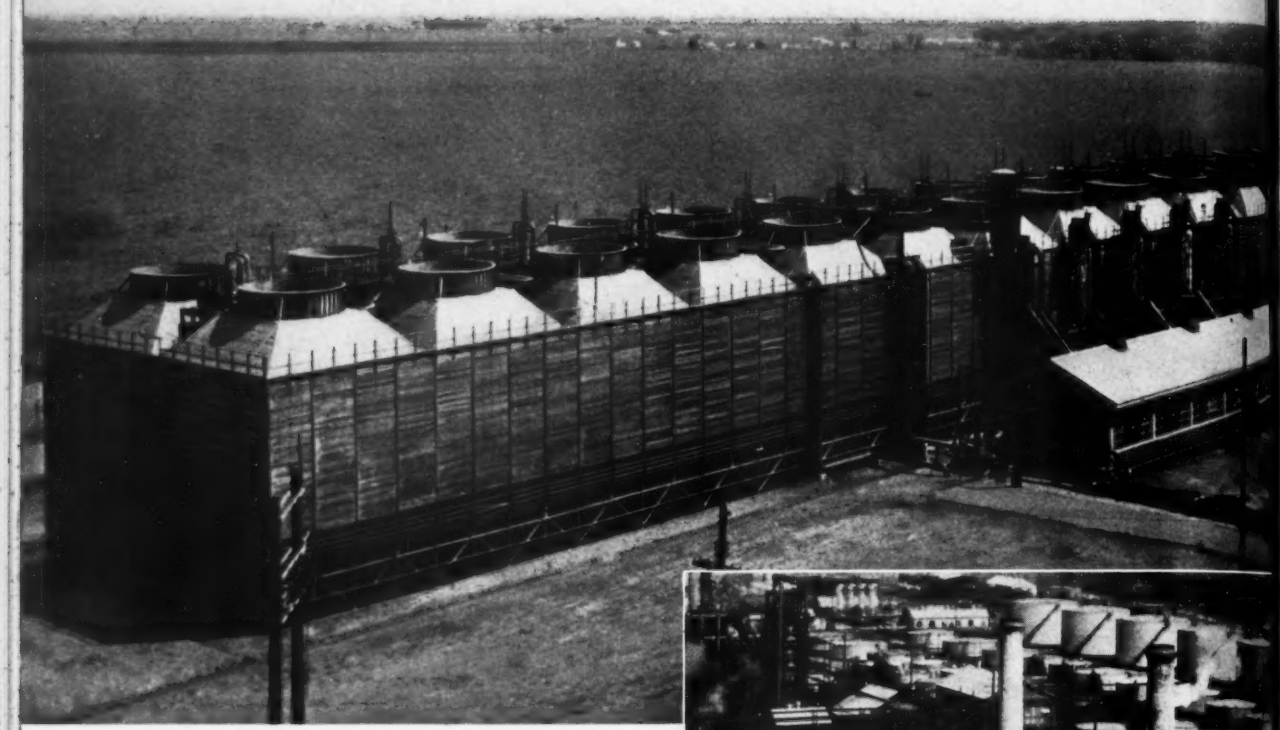
refinery cooling towers



Above: This 32-cell induced draft tower cools 120,000 gallons per minute from 130 to 95°F. at a wet bulb temperature of 85°F.

Right: A 20-cell induced draft tower which cools 30,000 gallons per minute from 115 to 80°F. at a wet bulb temperature of 70°F.

Foster Wheeler cooling towers are engineered to deliver full capacity all year long despite seasonal variations in atmospheric conditions. Analysis of each cooling problem is basic to the selection of the correct tower. The wide experience gained by Foster Wheeler engineers in design and construction of cooling towers for service under all climatic conditions insures high-efficiency cooling.

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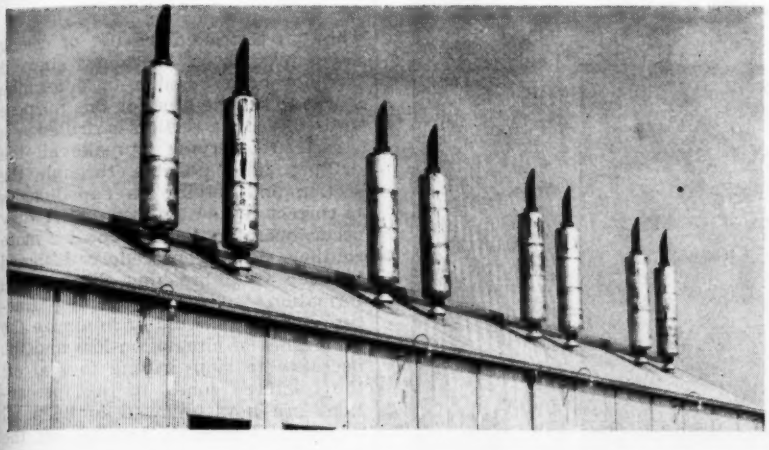
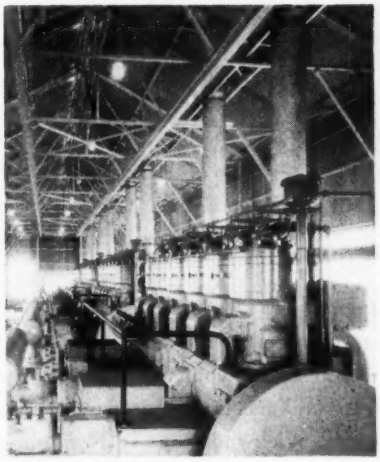
PIPE-LINE SUGGESTIONS



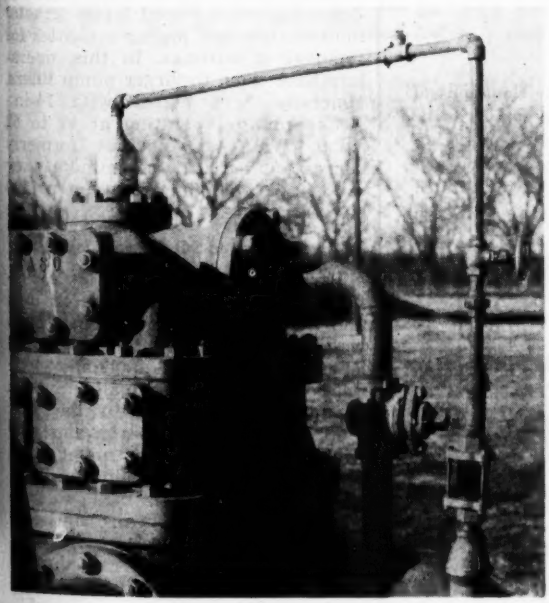
Bracing For Exhaust Pipes Eliminate Guy Line

THE need for guy lines and outside bracing has been eliminated by steel I-beam frame work below the roof; this holds the exhaust pipes rigidly. Above the roof, exhaust pipes are connected with mufflers. This installation is at a recently completed compressor station. The effectiveness of this type of interior bracing was demonstrated during winter storms.



Concrete Telephone Booth At Compressor Plant

A CYLINDRICAL telephone booth with a 3-in.-thick concrete wall has been built outside a compressor plant of a major company in the Carthage, Texas, field. When the steel door is closed, outside sounds are excluded.



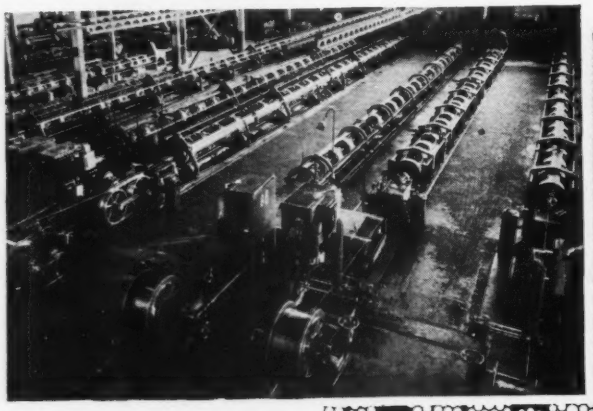
Sight Glass Installed on Air Bleed Line

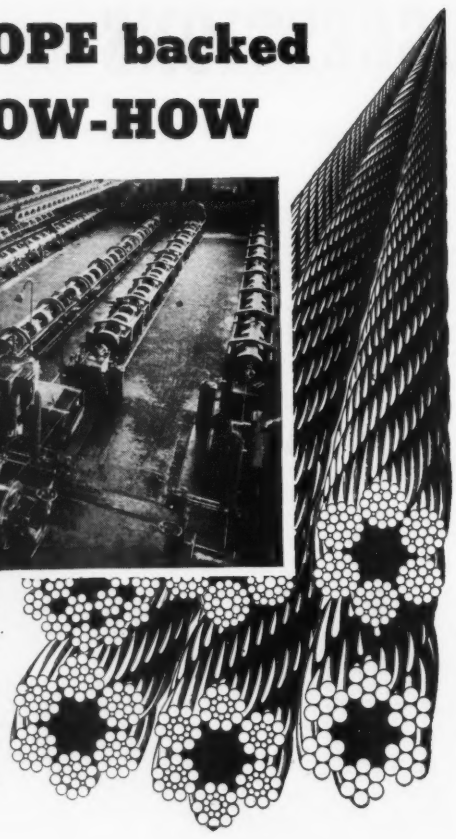
A SIGHT glass consisting of a short glass nipple installed on the air bleedoff line enables the operator of a gathering pump to close a valve to prevent unnecessary loss of oil, after air has been completely blown from the pump. This device is used on both discharge and suction pumps in Moore field, central Oklahoma.

Markers for Airplane Patrol

THIS type of marker with slanting sheet metal plates has advantages for clearly displaying figures to designate a location on a pipe-line route so as to assist in airplane patroling. The marker in the illustration is on the route of a major crude-oil pipe-line system in West Texas. Adequate marking of a route guides the pilot and enables him to report the position of trouble more accurately to the company's dispatcher.

Buy the ROPE backed by the KNOW-HOW





Here are a few of the stranding machines in Wickwire Spencer's modern wire rope mill. In principle, these machines are not unlike those found in many rope mills. The difference—the thing that makes Wickwire Rope longer lasting—lies in the making of the steel and drawing of the wire used in the rope.

Only steel wire with the highest possible degree of perfection in hardness, strength, toughness and fatigue-resistance is used. And every wire used in making Wickwire Rope is drawn until it's accurate within a fraction of a thousandth of an inch.

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PACIFIC COAST—The California Wire Cloth Corporation, Oakland 6, California

Drilling Costs Lowered 25% in Rangely Field

(Continued from page 151)

This has restricted the use of casing along to shut off the zones since it has not been possible to determine where to set the pipe for this purpose until the entire section is drilled.

Instead of trying to make all the drilling time possible through the section and relying on expediencies to correct circulation losses after they occur, operators have adopted a more cautious drilling procedure designed to keep from breaking through the formation walls and opening fractures, and thus avoid or minimize the occurrence of circulation loss and the necessity to stop drilling to seal off the fractured zones. In this, precautions are now followed to keep all weight and pressure possible off the formation and avoid any excessive loads or impulses that might tend to break out the walls.

This practice in general calls for use of lighter-weight, low-water-loss mud, reduced viscosities and lower pump pressures, and maintenance of more uniform and constant circulation rates. Mud weight as a rule is being restricted to a maximum of 9.3 lb. per gallon and water loss to 12 cc. Some operators as an extra safety precaution keep the weight under 9 lb. per gallon. Best results are obtained by holding the viscosity within a range of 36 to 40 seconds. A good, clean, low-gel mud obtained with a minimum of chemical treatment is desired. Pump pressure through the section now is being limited to from 450 to 650 psi., which is somewhat lower than has been maintained in the past.

Compensating for the reduced pump pressures and lower mud viscosity, dependence is placed upon greater mud volume and higher velocities for removal of cuttings. In this, operators have gone to larger pump liners, generally 7 or 7¼-in. with 14-in. stroke pumps operating at 45 to 52 s.p.m. Whereas velocities formerly ran as low as 80 ft. per minute, they now have been increased up to 140 ft. per minute.

Balanced Mud Provided

Particular importance is being attached to providing a balanced mud and avoiding any abrupt changes in weight, viscosity, or other characteristics. Mud is mixed slowly and specifications adjusted gradually. Sudden changes or "slugging" of the mud tend to create impulses against the walls of the holes that might cause breaking out and opening of fractures. Every effort is made to keep from disturbing the walls any more than is absolutely necessary.

Reduction of drilling rate through the section also has been found bene-

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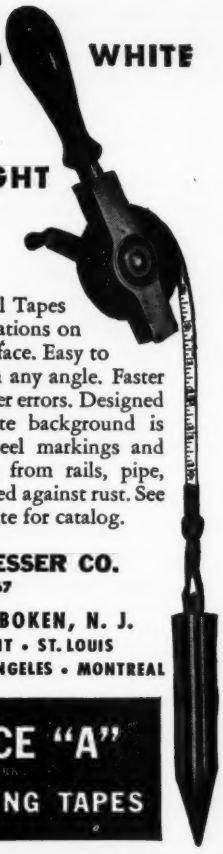

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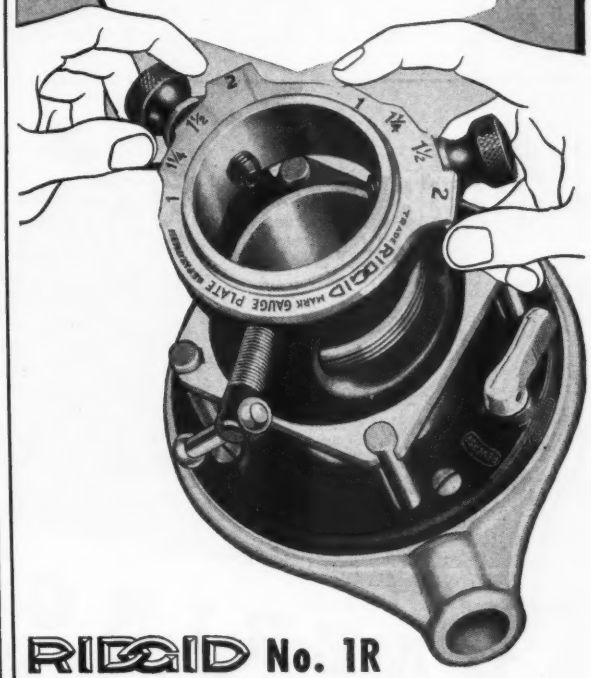

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ficial in eliminating trouble. Best results are being obtained by holding the drilling rate under 15 ft. per hour. In the past it was customary to make around 30 to 35 ft. an hour, and in some cases as much as 300 ft. has been drilled in an 8-hour tour. While the rate will vary somewhat with the size of the annulus, mud velocity, and volume, the reduced rate minimizes the chance of disturbing the walls and also permits a closer control of mud loss should it occur.

In the event the hole should start taking mud it has been found good practice to stop drilling immediately, pull up off bottom, and keep pump pressure and circulation off the point of loss. Mud loss may be sudden and complete, in which case a different problem is presented, but generally it is only gradual, or at least starts gradually. When drilling slowly, indications of the start of loss usually can be observed before penetrating far enough into a fractured zone for serious trouble to develop. In many cases, after pulling up, conditioning mud, and adding formation-sealing material, and allowing the hole to stand quietly for a time, the trouble will end and permit drilling ahead easily.

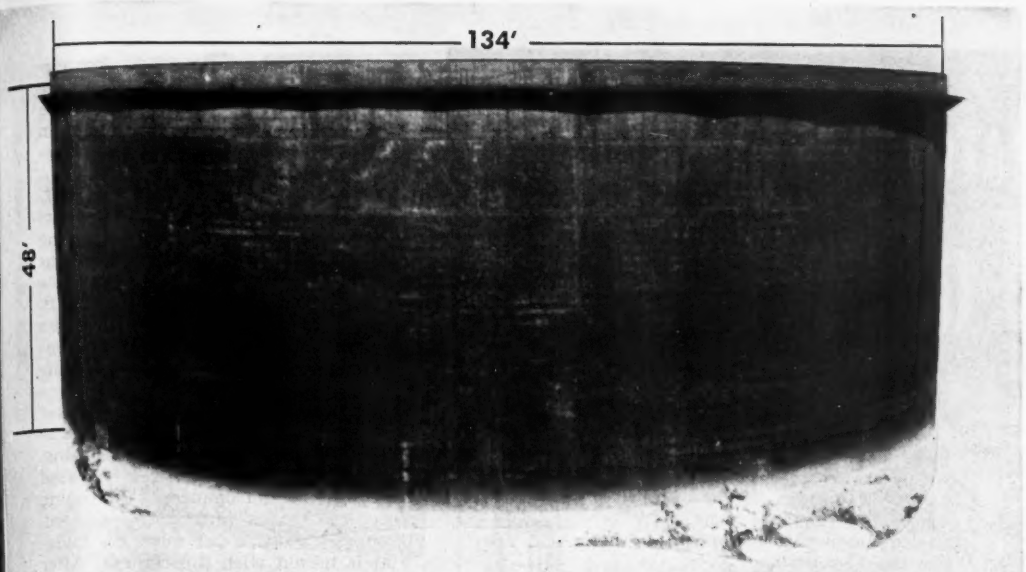
It is not unusual, however, for loss of circulation to occur at some point up the hole although the formation may have been drilled originally without any indication of trouble. The wall may have been strong enough at the time to hold up but with continued drilling and rotation and pressure it might break out at some weak point and open fractures. Although it is easier to control loss of circulation at the bit than up the hole, the same corrective procedure often has been found effective. The chief complication under such circumstances is in determining the exact point of mud loss. This is accomplished, however, by pulling up and attempting to circulate at successively higher levels until the place is found where no loss occurs. Then, with the bit pulled above the point of loss and pump pressure and circulation kept off of it, the hole is allowed to stand quietly for a time as previously described.

Cementing Fractured Zones

When the hole does not respond to such measures and pumping formation-sealing materials with the mud fails to remedy the trouble, cementing of fractured zones then usually must be resorted to. It is preferred not to use cement since the additional weight and pressure imposed on the formation when placing the cement might cause the walls to break through still more and aggravate the trouble, but frequently this is the only alternative. The hazard is being lessened, however, by placing the cement in smaller batches, generally not more than 20 to 25 sacks at a time. In the past, it has been customary to run batches of as much as 200 sacks at a time. With small batches the weight and pressure imposed on the formation are reduced, which minimizes losses and insures more effective placement and utilization of the cement in building up the column through the zone. Care is taken to allow sufficient time for each batch in turn to set well before the next batch is placed.

Holes as a rule are started with from two to three joints of 16-in. conductor pipe. Nine-inch pilot hole then is drilled to a depth of 2,500 to 2,800 ft., or through that part of the section in which the worst lost circulation zones generally occur. Although fractured zones sometimes occur below this depth, they usually do not give much trouble, and with the upper zones protected, the remainder of the hole to the top of the oil sand can be drilled without additional pipe.

After drilling the 9-in. hole, mud weight gradually is built up to test whether the formations will break through and allow mud loss. If loss occurs it is necessary to find the point of loss and correct. If not and the hole appears in good condition, it is reamed to 13⅜ in. to the point where it is desired to set the 10¾-in. surface casing. Some operators still prefer to set this string entirely through



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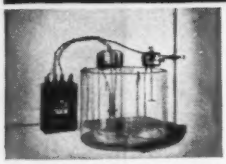

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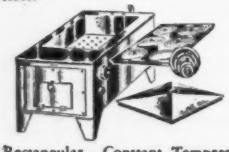

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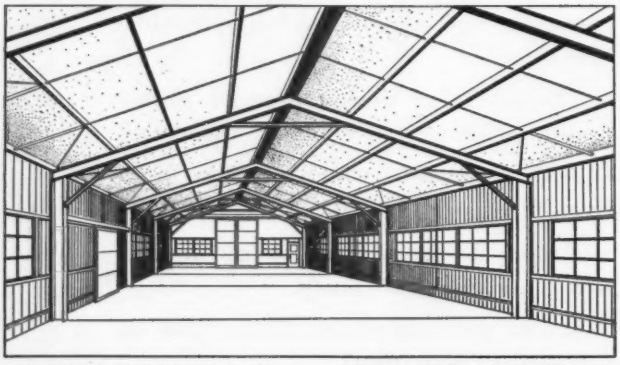

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the section where the worst lost circulation zones occur as assurance against recurrence of trouble when drilling the lower part of the hole, in which use of heavier mud and special treating are required.

With the development of more effective methods for drilling the lost-circulation zones and maintaining hole against trouble, the trend has been toward use of shorter surface casing, usually from 500 to 1,000 ft. Length of strings, however, varies widely, depending on conditions encountered in different parts of the field and in individual wells. Practice is to set them through the lowest lost-circulation zone which gave indication of greatest trouble in drilling. In cementing, light slurries are used to minimize the chance of reopening fractured zones and losing cement. Approximately 2 per cent gel material is mixed with the cement. After pumping sufficient cement calculated to fill the annulus, temperature surveys are run to determine the top if circulation is not obtained. If cement is not to the top, sufficient additional cement then is pumped through a macaroni string into the annulus to fill up. This is done in stages as a precaution against disturbing the walls any more than necessary.

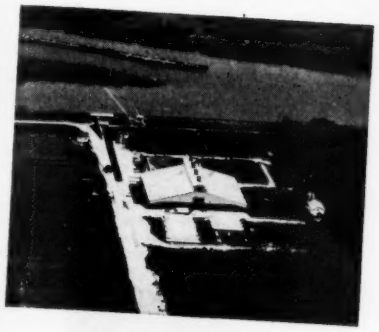
Caving and Bridging

In the lower part of the Mancos shale section, caving and bridging have been the main hazards. The chief trouble occurs in the bottom 300 ft. This trouble, however, gradually is being eliminated by maintaining uniformity in mud properties and circulation rates, and by higher velocity and greater mud volume instead of viscosity and high pump pressure to remove the cuttings. As in drilling the lost circulations, precautions are taken not to disturb the walls any more than necessary, and to keep the cuttings in suspension and clear. It has been found that the mud-weight factor cannot be played with as even a slight increase in mud weight seems to accentuate heaving if it starts to occur. Only the water loss can be adjusted, and at the first sign of caving or bridging the water loss should be lowered and the gel strength raised for effective control.

Through the precautions followed in preventing or minimizing loss of circulation, mud bills per well for this part of the hole on the average have been reduced from around $8,500 a year ago to a present figure of around $4,000. In some cases, costs have been as low as $2,000. Drilling time through this section has been reduced as much as 15 days in the same period.

Below the Mancos shales, mud weight must be built up to control relatively high water and gas pressures in the Dakota sand topped around 3,200 to 3,300 ft. A fairly uniform 5-ft. quartzite formation about 65 ft. above the Dakota sand serves

NOW..



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as a marker for the start of building up weight. Pressures require a weight of from 9.5 to 10 lb., on which a close balance must be maintained to prevent breaking out of any uncased fractured zones in the overlying Mancos shales.

Particular benefits in speeding up drilling in the lower part of the hole have been obtained by using more drill collars. Some operators have experimented with as many as 15 collars although this number has been found excessive. General practice now is to have three drill collars on the string by the time the Dakota sand is topped, and then increase this number to from five to eight by the time the Weber sand is topped. With more than five drill collars rotary speeds usually are held to not more than 80 r.p.m. for most effective drilling. With fewer drill collars speeds often are increased to from 125 to 150 r.p.m.

Checking Time Losses

As a means of checking where losses of time occur in any drilling well and in an effort to stimulate reduction of well time, one of the major companies in the field has followed a plan of plotting the time of each well as drilled against that of the "pattern" well. The pattern well always is the one for which the record time was made, and when any new well sets a record its time is set up as the pattern for other wells to follow. Fig. 1 is a typical time-curve record for drilling that part of the hole from the surface to the top of the Weber sand. At the time this plot was made, the record time of any well to the top of the sand was 46 days. Since then a well drilled to the sand in 38 days has become the pattern. Fig. 2 is typical plotting time for drilling the Weber sand in which the pattern time then was 6 days. Use of this system is enabling the operator to determine which contractors, rigs or crews are making the best time and which consistently are unable to keep up with the pace of the field. By studying the circumstances and reasons in each case, the operator is in a better position to work out ways for improving the time.

Credit For Article Omitted

The article "Design of Long-Distance Natural-Gas Transmission Lines," by R. G. Strong and T. H. Beals, which was published in the April 19, 1947, issue of the Journal was from the program of the spring meeting of the eastern district, Division of Production, American Petroleum Institute, held at Pittsburgh, April 16-18. Acknowledgment was inadvertently omitted that this was an A.P.I. paper.

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BOOKS

PETROLEUM PRODUCTION: VOLUME 3, OIL PRODUCTION BY WATER. By Park Jones. Published by Reinhold Publishing Corp., 330 W. 42nd Street, New York. 271 pp. $5.

This volume is limited to oil production by water. Primary gas caps are not considered. The principal factors in production of oil by water are convergence, fluid factors, invasion factors, displacement factors, and well-interference factors. Currently, new water-injection projects are in operation, starting, or are under active consideration in practically every oil-producing state. However, water-injection operation is but one of the several major phases involved in the broader subject of oil production by water. In covering the numerous aspects of the role that water plays in producing oil, the chapters include procedures and methods for planning pool-development programs for maximum profits by water drive. A number of thought-provoking concepts are introduced and carried through with illustrative curves and actual numerical solutions.

PUBLIC RELATIONS IN ACTION. Edited by Philip Lesly. Published by Ziff-Davis Publishing Co., 350 Fifth Avenue, New York. 280 pp. $4.50.

This is said to be the first compilation of case studies in successful public-relations activity. It marks the maturity of the profession, which has brought fundamental changes in the operation of business, labor, and Government. Program performances and achievements make case-history material and it was a natural consequence that this workbook grew out of the prescribed statements and supplemental exhibits that were entered in judging the 1945 American Public Relations Association awards, and that this "how it was done" compilation was made available. The volume should help provide new answers and fresh answers to old questions and continuing problems.

THE HOW AND WHY OF PAYROLL RECORDS. An original research project by Frank M. Knox Co., Inc. Published by Ross Martin Co., Tulsa. 136 pp. $2.

This book analyzes the record-keeping problems that have so enormously increased during the past decade, from two standpoints: the requirements of the laws, and practices followed by business organizations. Each of the four basic payroll and personnel laws is discussed and tables have been prepared showing the exact requirements of each in relation to data and information that must be kept on the company's records. The tables not only show what data must be kept, but also show who must make the record, to whom it should go, how often it must be submitted, and how long it should be kept. Government forms dealing with employment and payroll-tax returns are discussed and illustrated. Guidance is given on which personnel records should or must be kept by small, medium-sized, and large organizations.

THOSE WHO KNOW YOU WELL THINK WELL OF YOU. American Petroleum Institute, 50 West 50th Street, New York. 272 pp. $4.

This is the full report of the exhaustive survey of what the public thinks about the oil industry, upon which the current oil-industry public-relations program primarily is based. The survey reflects interviews with some 10,000 adults. Results are broken down into 18 different categories so that public opinion and knowledge on each question may be determined, not only by sections of the country, but also by producing and refining areas, sex, age groups, race, urban or rural, type of employment, income level, union membership, politics, car owners, oil-industry employes, and influence groups.

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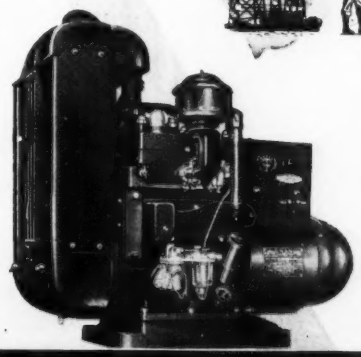

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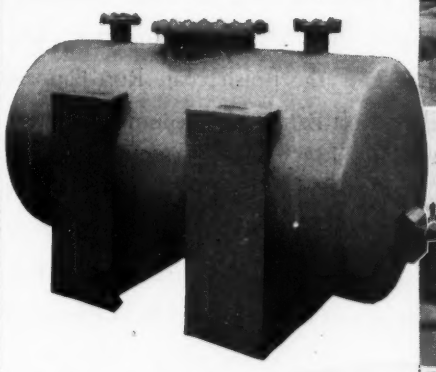

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Principle

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Essentially a hydraulic brake consists of two parts, a rotor and a stator. The rotor is keyseated on a shaft. The stator, held stationary, is supported by bearings on the hub of the rotor. On both sides of the stator and of the rotor there are vanes, forming pockets, set under an angle in the direction opposing the direction of the rotation. (Fig. 18).

Water is made to flow from the chambers in the walls of the stator through a series of nozzles into the pockets of the rotor. With rotor revolving, the water is thrown, with considerable velocity, to the outer circumference of the rotor, is there deflected into the pockets of the stator, flows downwards along the outer walls of the stator's pockets and at the bottom is drawn back again into the rotor. The revolving of the rotor is retarded and the energy is dissipated by resistance offered by the fluid while moving from the rotor to the stator and back to the rotor again and by friction of the fluid on the walls of the pockets. The capacity of a hydraulic brake is directly proportional to the speed of rotation and to the diameter of the rotor. Within any given speed the degree of resistance is regulated by the control of the fluid level in the brake.

Dissipation of energy results in heating of the fluid and proper circulation is fundamental prerequisite for satisfactory operation of the brake. The circulation is automatic, cool water being introduced at the bottom of the brake with hot water being discharged through the outlet pipe at the top of the brake.

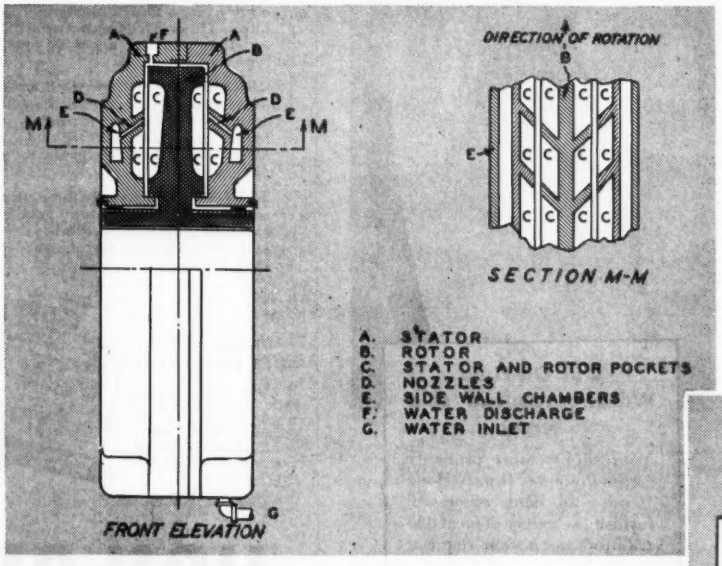

Fig. 18 — The hydraulic draw-works brake

Installation and Operation

Fig. 19 shows a schematic arrangement of a hydraulic-brake installation. Such an installation consists of the brake, the circulating tank, standpipe, and necessary connections. Cooling tower may be provided on top of the tank, if conditions warrant the use of this equipment.

The circulating tank is located outside of the derrick, as close as possible to the brake, with the deck of the tank level with the bottom of the brake. The tank remains full of water.

The brake is placed in operation by opening of the water-supply valve and filling the brake to the desired level. This level may be checked by pet cocks on the brake and float on the standpipe. The automatic circulation of the water starts with beginning of the lowering operations. As the load is increased, with additional stands of pipe being added in going in the hole, more fluid is added to the brake, to raise fluid level and increase the resistance. Water is drained from the brake, after lowering operations are completed.

Discussion of the hydraulic brake will be concluded in the following installment.

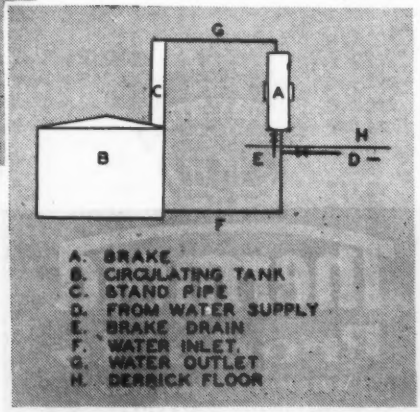

Fig. 19—Schematic arrangement of a draw-works hydraulic-brake installation

No. 17 in a series by Joseph Zaba, petroleum engineer, Houston

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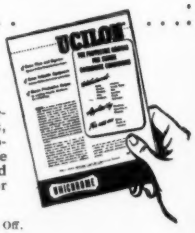

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The Refiner's Notebook

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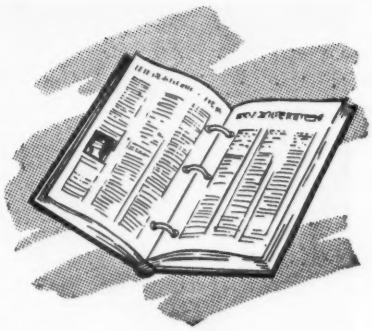


Acid Quality—Plant And Laboratory

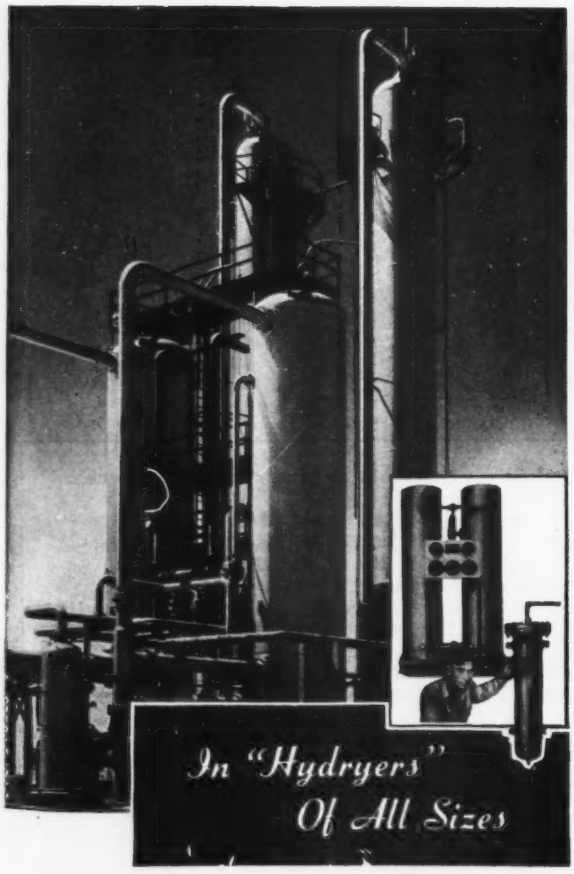
INSTRUCTION. — Quantities of acid are customarily expressed as pounds 66° Baume sulfuric acid per barrel of oil. The second and third columns in the table show the per cent by liquid volume and the milliliters of acid per liter of oil.

More recent Refiner's Notebooks of particular interest to chemists are:

Sulfuric Acid Solutions, No. 74, Dec. 29, 1945, p. 321.
Caustic Soda Solutions, No. 79, Feb. 2, 1946, p. 91.
Hydrochloric Acid Solutions, No. 82, Feb. 23, 1946, p. 189.
Alkaline Solutions, No. 85, March 16, 1946, p. 123.
Viscosity Conversions—Low Range, No. 108, Aug. 31, 1946, p. 103.
Caustic—Sp. Gr., No. 122, Dec. 7, 1946, p. 119.
Viscosity Conversions—High Range, No. 130, Feb. 8, 1947.
Acid—Specific Gravity, No. 133, Mar. 1, 1947.
Doctor, Caustic, and Carbonate, No. 138, April 5, 1947.

Lb. 66° Be. acid per bbl.	Liq. vol. per cent acid	Ml. acid per liter	Lb. 66° Be. acid per bbl.	Liq. vol. per cent acid	Ml. acid per liter	Lb. 66° Be. acid per bbl.	Liq. vol. per cent acid	Ml. acid per liter
1	0.155	1.5544	31	4.60	48.186	62	8.70	96.372
2	0.310	3.1088	32	4.75	49.740	64	9.07	99.480
3	0.464	4.6632	33	4.88	51.295	66	9.30	102.590
4	0.618	6.2176	34	5.01	52.850	68	9.56	105.700
5	0.771	7.7720	35	5.15	54.404	70	9.81	108.808
6	0.924	9.3264	36	5.30	55.958	72	10.05	111.916
7	1.076	10.8808	37	5.45	57.513	74	10.31	115.026
8	1.229	12.4352	38	5.59	59.068	76	10.59	118.136
9	1.379	13.9896	39	5.71	60.622	78	10.82	121.244
10	1.531	15.5440	40	5.85	62.176	80	11.08	124.352
11	1.681	17.098	41	5.99	63.730	82	11.32	127.460
12	1.831	18.653	42	6.13	65.284	84	11.55	130.568
13	1.980	20.207	43	6.27	66.838	86	11.79	133.676
14	2.13	21.762	44	6.40	68.392	88	12.05	136.786
15	2.28	23.316	45	6.54	69.947	90	12.28	139.896
16	2 43	24.870	46	6.68	71.502	92	12.50	143.004
17	2 58	26.425	47	6.80	73.057	94	12.77	146.114
18	2.72	27.979	48	6.94	74.612	96	13.00	149.224
19	2.87	29.534	49	7.08	76.166	98	13.21	152.332
20	3.02	31.088	50	7.22	77.720	100	13.48	155.440
21	3.16	32.642	51	7.35	79.274	110	14.62	170.98
22	3.31	34.196	52	7.48	80.828	120	15.73	186.53
23	3.45	35.751	53	7.60	82.383	130	16.80	202.07
24	3.60	37.306	54	7.74	83.938	140	17.86	217.62
25	3.75	38.860	55	7.88	85.493	150	18.90	233.16
26	3.88	40.414	56	8.02	87.048	160	19.93	248.70
27	4.03	41.969	57	8.15	88.602	170	20.92	264.25
28	4.17	43.524	58	8.27	90.156	180	21.87	279.79
29	4.31	45.079	59	8.40	91.710	190	22.80	295.34
30	4.46	46.632	60	8.53	93.264	200	23.70	310.09

No. 141 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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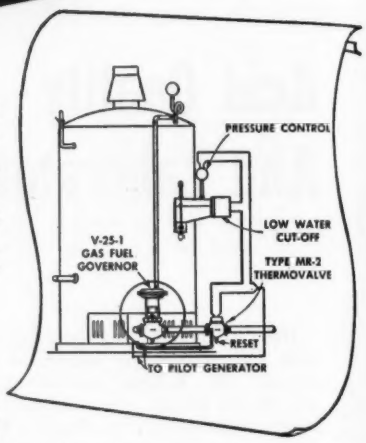

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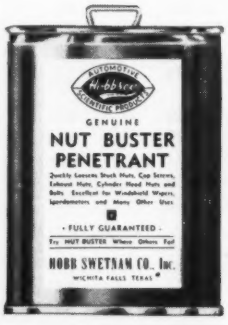

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ENGINEERING fundamentals

Mud Acidization May Be Helpful Before Squeeze Cementing

MUD generally has been regarded as the main hazard in getting a good water shut off in squeeze cementing. Many believe that some mud may be forced back into the formation and perhaps this may be true in various instances. In squeezing, below the squeezing tool a certain space is filled with drilling mud. The mud is heavy on bottom due to settling during trips out of the hole and from the higher temperatures at the bottom of the hole. This could be remedied if a long tail pipe could be used, washing to bottom with clear water before setting the tool. However, in most cases this is impractical as a short tail pipe is used at the base of the squeeze tool. With water, any heavy mud sheaths are not removed. One cannot lower the setting tool below the perforations due to the danger of cutting the packing rubber against some jagged piece of pipe. Furthermore, the muds have the opportunity to travel back into the sand formation. After this travel has ceased, the muds may congeal and harden. The larger void spaces will receive a greater portion than the less-permeable sands.

Successful Formation Cleaning

A way in which to clean a formation successfully is with the use of mud acid before squeeze operations. The acid can be used to clean the formation as well as to open any channels or more permeable sections already stopped up by the mud infiltration and water. The acids do not retard the setting of the cement in the sand; if anything, they may tend to speed the setting due to the heat created while being pumped through the formation. The cement should have a better chance to adhere and establish a better bond with the formation by the sands being cleaned and not contaminated with muds. As a matter of fact, the 15 per cent acid is spent by the time it has traveled back into the hole, and is neutralized. Water can be used to follow the acids to dilute further and disperse any remaining acid. This eliminates any possible reaction of the cement with the acid.

The well can be killed in the standard way. All preparations are made for squeezing the well as with any regular squeeze job. The only special requirement is to have a squeeze tool which permits circulation through the tool into the tail pipe as is done in a cementing operation.

Tail-Pipe Installation

A tail pipe must be installed that will reach to the bottom of the hole so the packer will not have to travel through the perforations. The tool should be placed with the tail pipe as near bottom as possible by first touching bottom and picking up the tail pipe just off bottom. Then approximately 15 bbl. of water should be pumped into the tubing string. This water ahead of the acid will wash out the loose muds on bottom and allow the acid to work on the muds that water will not remove. The amount of acid desired is then pumped into the tubing string.

If the tubing holds more than the amount of acid that is to be used, follow up the acid with water, preferably salt water, so that the acid will have displaced the water in the bottom of the hole. Raise the squeezing tool to the desired height and set the tool preparing to squeeze. Break the formation down with acid. After the formation has started to take the acid, begin to mix the cement and squeeze the well, forcing all of the acid and water in the tubing into the formation ahead of the cement. This eliminates one hazardous operation, the second setting of the squeeze tool just before the cement reaches the bottom of the hole. With the use of acid, the operator has only one setting of the tool, whereas in breaking down with mud he has two operations.

The acid used in this manner should clean the hole, dissolve all of the mud sheath, and clean the formation. The acid will open the void spaces between the sand grains by cleaning and removing all of the muds which have penetrated the formation.

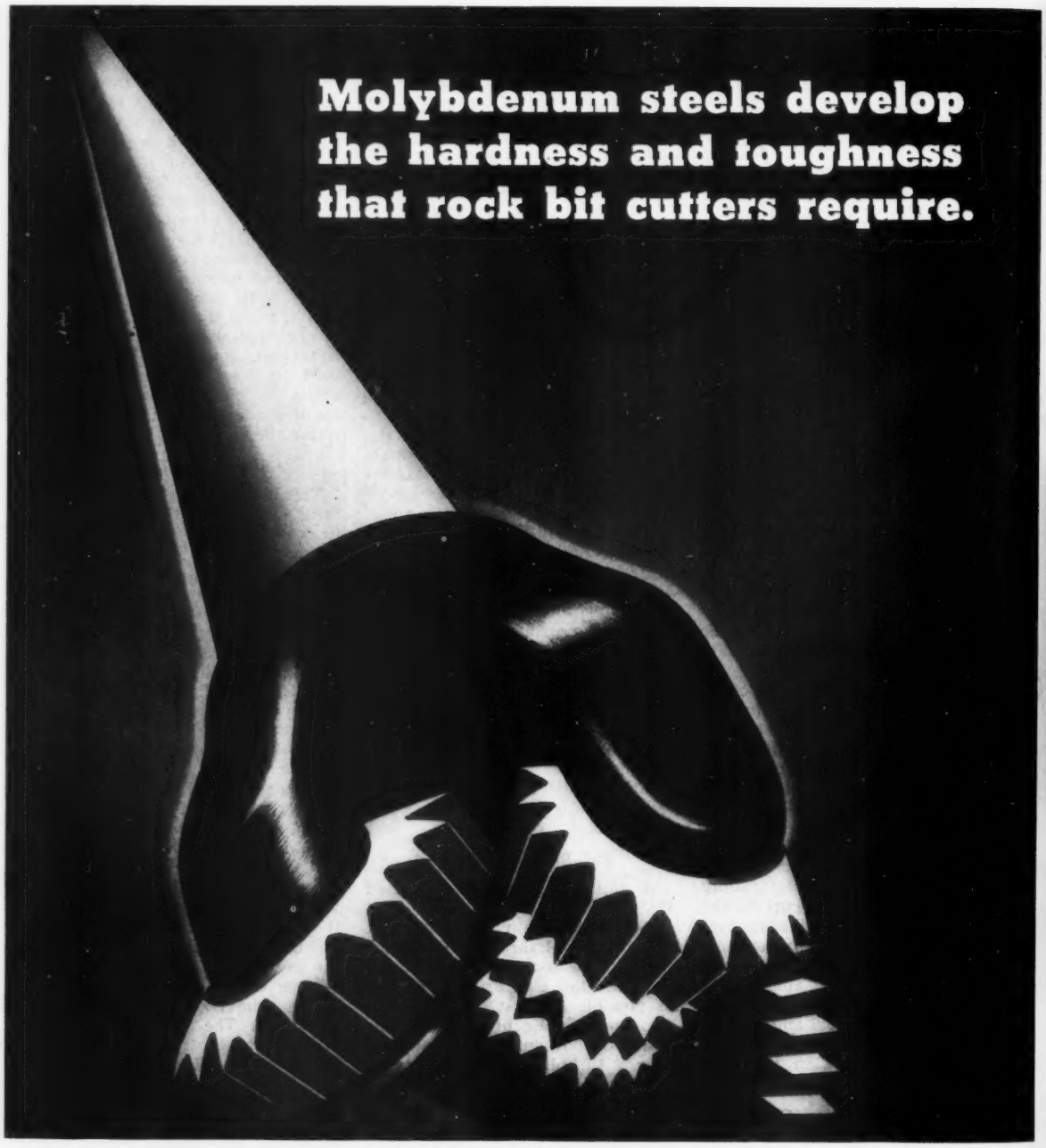
Reason for Failure

This method has been used on three different wells by the writer to date and each has had a satisfactory squeeze job. One other well on which the acid was used was a failure on the first squeeze operation. This was believed due to the operators not displacing all of the mud in the casing, as had been suggested. This allowed the acid to enter the formation at the first possible point, probably the top section.

Breaking down of the formation by use of acid generally requires about one-half of the surface pressures required in breaking down the formation with muds. This should be considered in many wells which have pipe that will not stand a high surface pressure plus the hydrostatic pressure of the mud. The formation, broken down with a lower pressure by the use of acid, would lead one to believe that the acid is evidently doing some good in cleaning the formation. The pressure used to break down the formation is generally decreased rapidly as more acid is pumped into the formation.

Many wells have been known to be impossible to break down for squeezing operations even with clear water on the bottom. Acid had to be used and the wells were broken down and squeezed successfully. One case was on a 7,600-ft. well where 7,000-psi. surface pressure was raised and 9.8-lb. mud used, and the formation would not break down. Acid was used and the well broke down at 3,000 lb. The operators squeezed into the formation 100 sacks of cement and had to stage the last 25 sacks to build up 4,500 lb. surface pressure. The squeeze job was successful.

Series prepared by Edward N. Jones, consulting engineer, Pettus, Tex.



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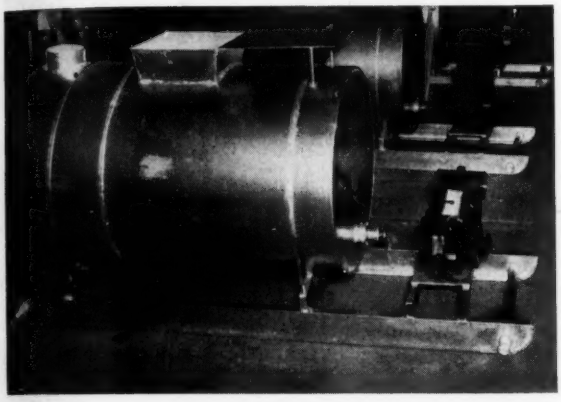
OIL AND GAS EQUIPMENT Digest

IT'S NEW ✓ CHECK IT

by John M. Spears

(1) NEW MUD MIXER provides fast and efficient mixing of muds and chemicals in oil-well drilling. Portable unit ties into suction with 2-in. valve to regulate flow into suction or mud stream. In operation mixer is filled half full of water and motor is started. One man pours



mud in (a sack a minute) and allows to mix to desired viscosity or weight before turning into mud stream. Operation does not affect pump pressure or rig shutdown time. Construction consists of a fabricated steel tank (500-gal. capacity) inside of which is an 8-in. outboard propeller turned by a one-cylinder air-cooled gasoline motor. System of baffles directs circulation of mixing. *Wichita Welding & Manufacturing Co.*

IT'S NEW ✓ CHECK IT

(2) MUD CIRCULATION-RATE INDICATOR measures fluctuations in rate of flow of drilling fluid as it is returned from well. Variations in rate of flow can be accurately correlated with pressure fluctuations resulting from penetration of a gas sand, water flow, drill-pipe washouts, loss of circulation, and any other factor which tends to increase or decrease rate of fluid circulation. Flow variations are continuously recorded and mechanically indicated and may be observed constantly by the driller on derrick floor as illustrated in Fig. 1. Fig. 2 illustrates principle of operation. Under a given pump pressure, drilling fluid rises to level "A" in the drilling-control assembly, a point usually several inches above the flow-line connection. This static head of fluid pressure controls the pressure on the flow line. Variations in the static head affect rate of flow of fluid from the well. To detect fluctuations in rate of flow, a small reservoir is placed in discharge flow line and fluid level "B" is consequently established. "B" level is relative to "A" level, and any variations in levels are instantly reflected in "B," which, in turn, are calibrated and indicated on a recording instrument mounted near the driller's position for observation. *A. L. Smith.*

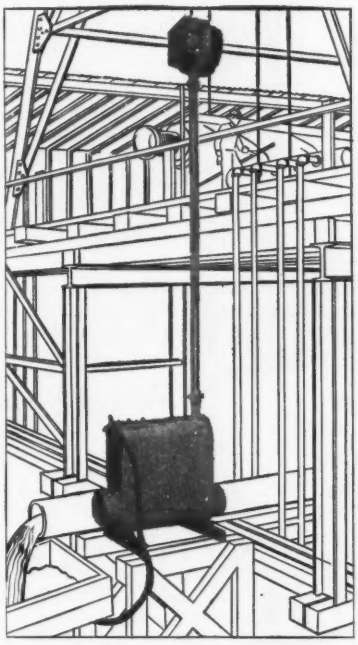


Fig. 1

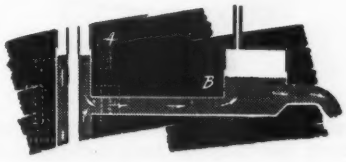


Fig. 2

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(3) RECORDING OSCILLOGRAPH, with all the features of a large camera, weighs 29 lb., complete with

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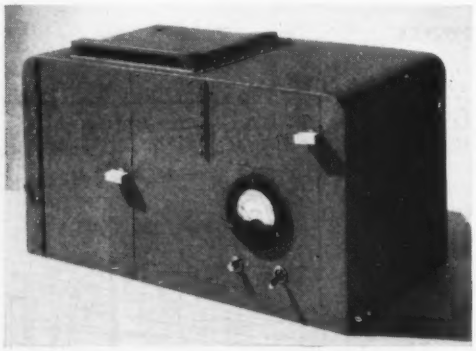
carrying case. This 25-trace tabloid oscillograph is a light, accurate, rugged recording camera measuring just 9⅛ by 9⅛ by 16¼ in. Incorporated within design are a prismatic viewing screen, magnetically coupled timing



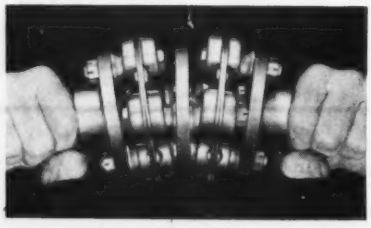
unit, and fully automatic operation. Components completely accessible for ease of maintenance. Unit is complete, hand-carried seismic-survey outfit. *Century Geophysical Corp.*

IT'S NEW CHECK IT

(4) STEEL-FABRICATED MOTOR employs new bearing bracket or end-shield design, which makes use of a solid flanged head as the basic shape with bearing assembly as a separate insert. Arrangement makes inspection and replacement of sleeve bearings relatively simple. These welded-steel squirrel-cage motors have drip-proof, splash-proof, and force-ventilated enclosures. Sizes range from 150 to 1,000 hp., 4 poles with corresponding ratings for other numbers of poles. *Elliott Co.*

IT'S NEW CHECK IT

(5) DOUBLE MORFLEX COUPLING is a new universal-joint-type coupling which employs two single Morflex couplings with a center-plate adapter. New model has twice the torsional resilience of the single coupling. Torsional resilience is obtained through the preloaded Neoprene-biscuit construction. Acting as a universal-drive connection, the double coupling accommodates offset and angular misalignment of shafts. With no metal-to-metal contact, it requires no lubrication, is proof against noise and vibration, reduces bearing wear, and is dielectric. *Morse Chain Co.*



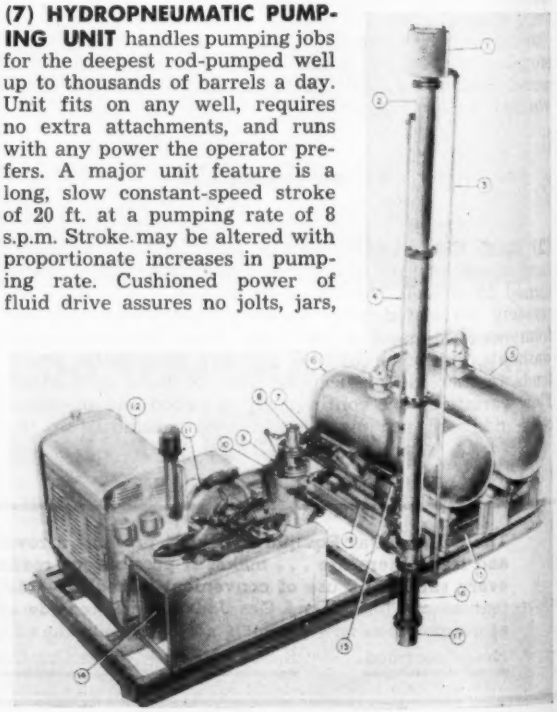
IT'S NEW CHECK IT

(6) PORTABLE SLUSH PITS keep mud at even temperatures, and save mud and water due to non-absorbing characteristics. Metal pits with either tapered or straight sides are telescoped into one another to form a compact

unit which can be moved across country by a tandem truck. No. I pit is 5 ft. high, 8 ft. wide, and 30 ft. long—others fit within. Pits are usually connected with 10¾-in. Dresser couplings. Metal mud runs may be set on top of pits so that a single pit may be used if desired. Steel construction consists of ¼-in. bottom, 3/16-in. sides mounted on 5 3/10-in. drill pipe. *Trico Manufacturing Co.*

IT'S NEW CHECK IT

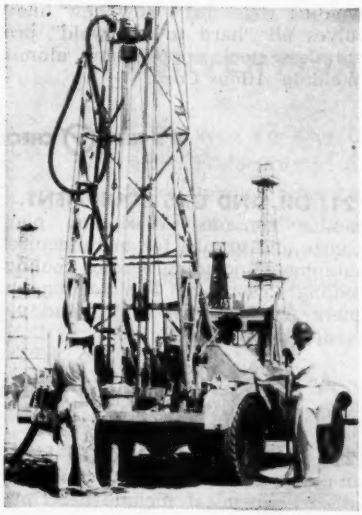
(7) HYDROPNEUMATIC PUMPING UNIT handles pumping jobs for the deepest rod-pumped well up to thousands of barrels a day. Unit fits on any well, requires no extra attachments, and runs with any power the operator prefers. A major unit feature is a long, slow constant-speed stroke of 20 ft. at a pumping rate of 8 s.p.m. Stroke may be altered with proportionate increases in pumping rate. Cushioned power of fluid drive assures no jolts, jars,



shocks, or vibration. Pressure built up in accumulator and maintained in a closed system, balances the rod load: to operate, the small centrifugal pump adds enough pressure to lift piston, and withdraw pressure to lower it. Power is always a lift, since pressure is always under the piston. Pressure never exceeds 250 psi. anywhere in the system. Few maintenance and replacement parts required. *Harvey Machine Co., Inc.*

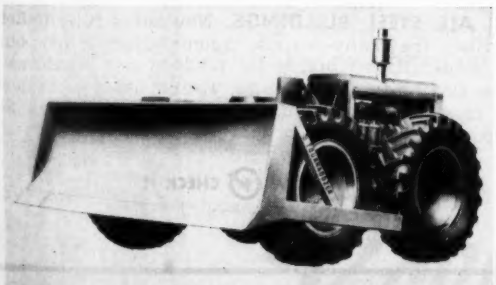
IT'S NEW CHECK IT

(8) SELF-LUBRICATED DRILLING UNIT requires no lubrication on any functional part of unit with exception of one zerk on the pull-down shaft and one zerk for swivel packing. This completely sealed portable model drills shot holes, shallow oil and gas wells, water wells, disposal wells, and performs other drilling operations. Unit is mounted on a 1½-ton truck with a hydraulically raised 50,000-lb. capacity tubular-steel mast. All power is from the truck engine to a power take-off and then transmitted through a central power unit to a three-speed rotary-table transmission, a double-drum winch, and a 4½ by 6-in. duplex pump and pull-down unit. All parts are designed so engine will stall before any part will break. Every functional part of unit, including swivel bearings, features dust-proof sealed oil-bath lubrication and requires no maintenance regardless of operating conditions. *Western Geophysical Co.*



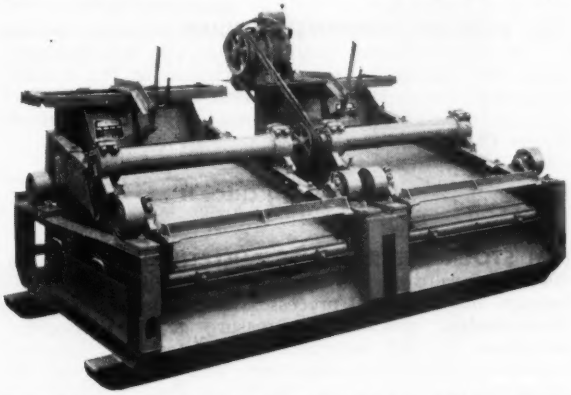
IT'S NEW CHECK IT

(9) HIGH-SPEED TOURNADOZER marks new development in rubber-tired earth-moving equipment. Powered by a 160-hp. diesel engine, it has four forward speeds ranging up to 12 m.p.h., and the same four speeds are available in reverse. With the constant-mesh transmission, operator can select any gear ratio or change from forward into reverse with no shifting of gears and no loss of momentum. Operator steers by use of air-actuated disk clutches and brakes controlling the two wheels on each side. Bowl is cable controlled and is operated by air-actuated power unit. Unit can move 184 cu. yd. an hour on a 50-ft. haul; 118 yd. on a 100-ft. haul; 66 on a 200-ft. haul; 46 on a 300-ft. haul; and 35 yd. on a 400-ft. haul. *R. G. LeTourneau, Inc.*



IT'S NEW CHECK IT

(10) DUAL UNIT MUD SCREEN consists of two 3 by 4-ft. mud screens mounted on a common skid frame. Unit construction includes an all-steel mud tank having right and left-hand discharge spouts; a screen supported on spiral springs; a vibrator unit mounted on screen box; a cloth mounted in screen box and stretched in two directions; a distributor chute, feed-regulation gate, by-pass gate, and motor stand; V-belt drive and guard. To assure that mud returned to pumps is free of cuttings, a flexible closure member seals the opening between the discharge end of screen and the mud tank. The twin screens can be operated together by use of a single 2-hp. motor. When drilling conditions are such as to require only one machine to run, tool pusher removes one belt to stop machine he wants to shut down. This gives flexibility of operation with resulting economies because of smaller sizes of screen cloth and parts used. *Overstrom & Sons.*



IT'S NEW CHECK IT

TRADE LITERATURE

(11) VACUUM SEAM TESTER. New bulletin gives description and application of seam tester which will locate leaks in any seam—pipe or tank. Unit weighs less than 16 lb. and is easily applied and operated. Various types illustrated. *American Pipe & Steel Corp.*

IT'S NEW CHECK IT

(12) AUTOMOTIVE LUBRICATION GUIDE. Service man's guide to automotive lubrication, trains men in proper method of lubricating all automotive equipment. Included in guide is history of lubricants, manufacturing processes, working principles, lubrication requirements of car and truck units, and the human and business side of lubrication field. *The Chek-Chart Corp.*

IT'S NEW CHECK IT

(13) CENTRIFUGAL PUMPS. New 12-page bulletin describes many types of self-priming centrifugal pumps for oil-field service and construction requirements. Each unit is illustrated and capacity and specifications covered. Also contains friction table of friction of water in pipes and other engineering data. *Carver Pump Co.*

IT'S NEW ✓ CHECK IT

(14) STEEL IN PETROLEUM INDUSTRY. Role played by stainless steel in the development of the petroleum industry, and a general forecast of its future applications in the varied phases of production and processing of oil, is comprehensively explained in new semi-technical brochure. A 36-page booklet, illustrated with pictures and graphic charts. *Allegheny Ludlum Steel Corp.*

IT'S NEW ✓ CHECK IT

(15) COOLING EQUIPMENT GUIDE embodies cooling towers, fin units, spray ponds, nozzles, etc. Includes complete data on all the latest innovations in the cooling equipment industry, plus a wealth of timely information on current cooling problems. *Santa Fe Tank & Tower Co.*

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(16) STOCK INSTRUMENTS BULLETIN. Lists over 150 different recording and controlling instruments for petroleum and industrial processes. List includes recording thermometers, pyrometers, pressure gages, voltmeters, ammeters, and pH recorders. Also listed are recording controllers, indicating controllers, and miscellaneous instruments and accessories. *The Bristol Co.*

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(17) TANK CAR CLASSIFICATIONS. A 32-page booklet contains list of commodities and the class of tank car commonly used under ICC and A.A.R. shipping-container specifications now in effect. Includes blueprint drawings of outlet valves, safety valves, and car tank anchors. *American Car & Foundry Co.*

IT'S NEW ✓ CHECK IT

(18) CLEANING OIL WELLS for lasting results is the subject of this four-page bulletin designed to give the answer to intelligent remedial work by explaining the Hi-Perm process for increasing the permeability of a productive zone. Application advantages and quantity and cost included. *Chemical Division of Atlas Production, Inc.*

IT'S NEW ✓ CHECK IT

(19) LARGE MOBILE SPUDDER. An all-steel spudder that drills oil and gas wells to 6,000 ft. and handles a wide range of servicing operations to 7,000 ft. is explained and illustrated in new four-page bulletin. Up to 5,000 lb. of tools can be swung on the 60-ft. derrick, an all-steel cantilever-braced telescoping box structure which is power raised and extended by a builtin winch. Unit is newest in company's mobile line. *Bucyrus-Erie Co.*

IT'S NEW ✓ CHECK IT

(20) LOW TEMPERATURE ARC WELDING. A two-color folder contains applications and data on arc welding at lower base-metal temperatures with low-temperature welding rods. Tells how new line of special electrodes solves all "hard to arc weld" problems on cast iron, stainless steel, copper, and aluminum alloys. *Eutectic Welding Alloys Corp.*

IT'S NEW ✓ CHECK IT

(21) OIL AND GAS EQUIPMENT. A 20-page general catalog contains description, plant illustrations, and charts and graphs for manufacturer's line of petroleum equipment including aerator cooling towers, counterflow cooling towers, Fin-Fan cooling units, pulsation dampeners. Typical applications and patented processes included. *Fluor Corp., Ltd.*

IT'S NEW ✓ CHECK IT

(22) CHEMICAL PRODUCTS LIST. New 20-page bulletin covers 66 chemicals and processes of preparation. Data on each chemical include description, physical properties, uses, shipping containers, and shipping regulations. *Hooker Electrochemical Co.*

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(23) TIMING MOTOR. A two-color folder describes a new self-synchronous timing motor for applications which require a constant speed at a given frequency, as for timing devices, recording instruments, heating controls, signaling systems, etc. Includes a cross-sectional view two times actual size, dimensional drawing, and speed range table. *R. W. Cramer Co., Inc.*

IT'S NEW ✓ CHECK IT

(24) ALL STEEL BUILDINGS. New set of color bulletins describes the many-purpose quonset-type utility buildings especially adaptable for oil-field use. Features include flexibility in structure, fire resistance, economy, and ease in construction. Illustrated. *Great Lakes Steel Corp.*

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FOR BETTER *Coring*

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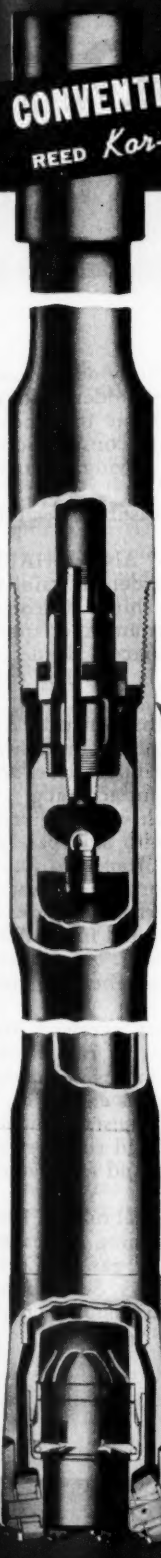
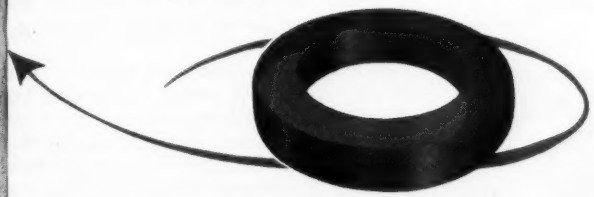


The REED *Kor-King*
CONVENTIONAL CORE DRILL

The Reed Kor-King Core Drill is simple in design, strong in construction and easy to operate. The new hard formation cutter heads have a forged steel crown with integral cutter bearing journals. This construction gives unusually strong support for the cutters and longer life for the cutter head.

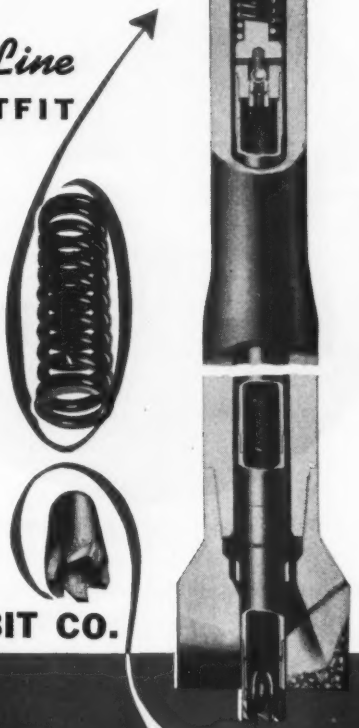
The oil resistant bearing, shown below, is replaceable at the rig and will help keep your core barrel out of the repair shop.



The REED "BR" *Wire Line*
CORING-DRILLING OUTFIT

The Reed "BR" Wire Line coring-drilling outfit has two distinct advantages: The Protrusion Regulator Spring permits the core cutter head to retract within the drilling bit in the hard formations; and permits the core cutter head to core ahead in the soft formations.

The replaceable core cutter heads assure maximum cutting action at all times, while coring.



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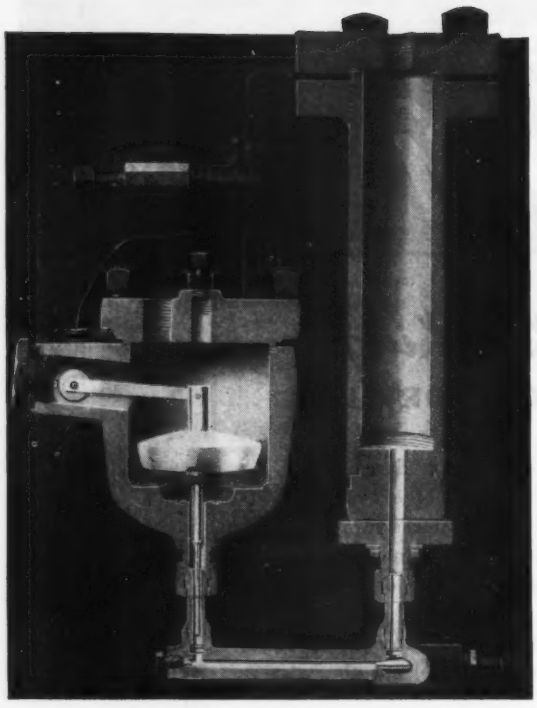


Cutaway section of meter body; Brown Mechanical Flow Controller.

Look

To The METER BODY For Precision Measuremer

THIS cutaway section of the meter body of a Brown Flow Controller shows some of its hidden features that contribute to precision measurement in process control. They combine with many other constructional refinements to result in an instrument having the optimum of measurement accuracy.

Prominent among the precision measuring features are:

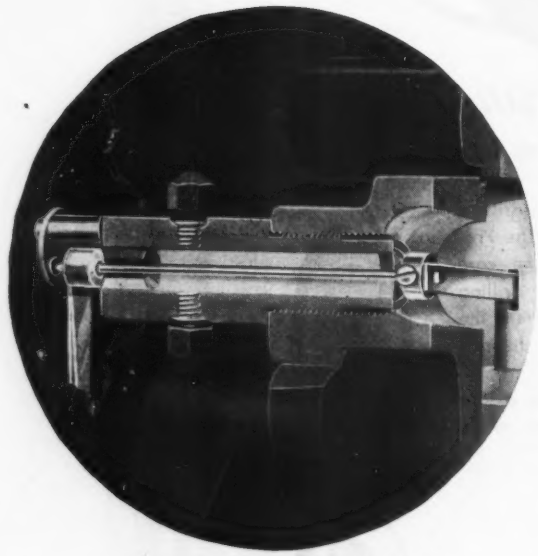
THE PRESSURE-TIGHT BEARING AND SHAFT. Ground and lapped bearings with hardened stainless steel sealing bushing and guide bushing. Chrome-vanadium steel shaft, diameter .109"; ground and lapped to clearance of .00005" at bearing surfaces. Hardened and polished thrust bearing. Housing is 1⅛" hex cold rolled steel.

THE FLOAT. Forged steel; weight 1.93 lbs.; vertical travel of 1.2" for 100% range. Provides positive motion to the pen linkage through the stainless steel post, lever and pressure-tight shaft for high measurement accuracy.

THE FLOAT CHAMBER. Forged steel; working pressures to 2,500 psi; circular in shape with side passage for pressure-tight shaft, and end plug for access to float lever set screw. Plastic-coated interior for increased measuring accuracy and resistance to corrosion. Cover is forged steel, approximately 1" thick, bolted in position with six ¾"-16 high tensile cap screws. A two-way spirit level is mounted on the float chamber for convenience in leveling when installing.

DROP LEG. Forged steel, with tubes screwed and welded to union couplings. Connected to range tube and float chamber by ground joint unions. *Damping Valve* has long conical taper on screw in end of drop leg. Sealed with packing and gland. Adjustable under pressure. *Drain Plug* is case-hardened cold rolled steel. Needle point screw for positive sealing and for gradual withdrawal of mercury when required.

RANGE TUBE. Cold drawn seamless steel tubing. Unit construction for quick and thorough cleaning. Threaded and welded assembly; recessed for cover gasket. Cover attached by ¾"-16 high tensile cap screws. Self-venting connections on both range tube and float chamber eliminate vapor lock.



Cutaway section of pressure-tight bearing and shaft assembly.

BROWN Air-O-Line

Twice . . . .

To The CONTROL UNIT For Positive Control

Brown *Air-o-Line* Recording Flow Controller (Chart plate and chart cutaway).

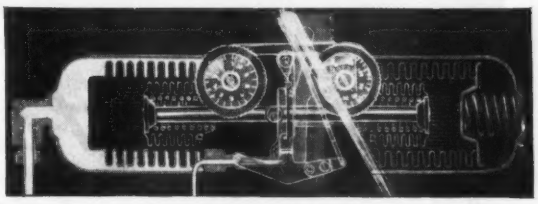
The Brown *Air-o-Line* Controller is accepted by engineers throughout industry as the outstanding achievement in air-operated control. It consists essentially of the *Air-o-Line* control unit (just above the cutaway chart in the illustration) and the non-bleed booster pilot (lower left). A turn of the graduated dials "tunes in" proportional band and automatic reset—quickly, precisely and without guesswork. Once "tuned in," *Air-o-Line* is fully automatic, lining out control at the exact set point and correcting for all load or throughput changes without cycling or offset.

Features contributing to the instrument's positive control include:

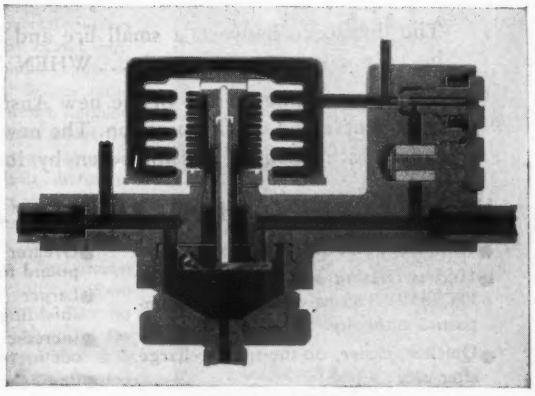
PROPORTIONAL BAND AND AUTOMATIC RESET ADJUSTMENT. Dials are accessible for adjustment without removal of the chart plate. The Proportional Band Dial is calibrated from 1% to 150%—sufficient to provide the flexibility required to meet any control problem. The Automatic Reset Dial is graduated in units from 1 to 10—ample to meet the load change requirements of any process.

CONTROL INDEX SETTING KNOB. Conveniently located at the top of the chart plate or externally, as desired. A 10 to 1 ratio between the index setting knob and the pointer permits micrometer adjustments of the control index.

THE NON-BLEED BOOSTER PILOT RELAY. Precision manufactured to minimum tolerances throughout. The double bellows unit has an area ratio of 5:1 for rapid response to changes in nozzle pressure. Large intake and exhaust ports insure rapid control valve operation. Capacity is 250% greater than the average bleed type pilot. Uses air only when increasing valve pressure, thereby reducing air consumption to a minimum.



Phantom cross-section of *Air-o-Line* control unit with proportional band and automatic reset; pioneered by Brown engineers.



Schematic section of non-bleed booster pilot relay.

Look twice . . . for the features contributing to accuracy of both measurement and control . . . and remember . . . in Brown *Air-o-Line* Flow Controllers they are combined to furnish positive flow control for any process.

Write for the Brown Flow Control Catalog, No. 2221. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Company,* 4488 Wayne Avenue, Philadelphia 44, Pa. Offices in principal U. S. cities and Toronto, Canada; London, England; Brussels, Belgium; Amsterdam, Holland; Stockholm, Sweden.

FLOW CONTROLLERS

Air-o-Line—THE COMMON DENOMINATOR OF PROCESS CONTROL

THE MASTER OF FLAME
ANSUL
REG. U.S. PAT. OFF.
FIRE EXTINGUISHING EQUIPMENT
duGas

DRY CHEMICAL
FIRE EXTINGUISHERS

New...

Faster Put-out by Inexperienced Operators

The difference between a small fire and a major disaster may be only a matter of seconds... WHEN THE FIRE STARTS.

An outstanding feature of the new Ansul-Dugas Extinguisher is its simple and quick operation. The new nozzle design makes expert extinguishing possible even by inexperienced persons.

HERE ARE OTHER IMPORTANT FEATURES

- 53% more Fire-Stopping Power.
- Highest Rating for SPEED and EFFECTIVENESS as determined by impartial authority.*
- Quicker, easier, on-the-spot recharge after use.
- Greater fire-fighting effectiveness pound for pound, dollar for dollar.
- Larger range stream and greater shielding of heat from operator.
- Increased fire-fighting capacity without increased weight.
- Engineered to resist corrosion.

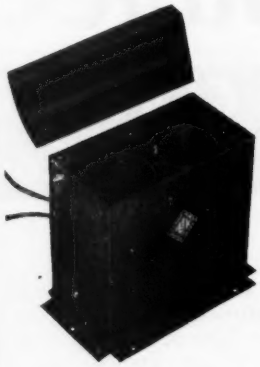
STOP FIRE FASTER!

with Ansul-Dugas Dry Chemical Extinguisher

*Write for charts based on authoritative data of comparative ratings as determined by a national approval agency.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

L-K ELECTRIC OIL SAMPLE HEATER
Available In Two Models:



MODEL A Designed to handle the small 15 c.c. centrifuge or small A.P.I. tubes. 2 or 4 Compartment.

MODEL B Designed to handle the pear - shaped A.S.T.M. 100 or 200 c.c. tubes. 2 Compartment only.

Heats to 240° on high stage in 15 minutes. Furnished with 3 stage arc-less switch. Pulls 7 amperes on high stage and 3 amperes on low stage. Not necessary to run car in order to obtain heat. Complete instructions for installing furnished with each heater.

L-K
PUMP VALVE CO.
P. O. BOX 901 • HOUSTON 1, TEXAS

Multi-Metal
Wire Cloth
Filter Cloth
All Meshes
All Metals
FABRICATED WIRE CLOTH

For more than 34 years Multi-Metal has designed and fabricated an infinite variety of filter units which involve the use of wire cloth. Multi-Metal stresses its technical facility. In addition to our fabrication plant, we carry a wide variety of wire cloth which is available by the roll and cut piece. Write for our new catalog and free wire cloth samples.

Multi-Metal
WIRE CLOTH COMPANY, INC
1350 Garrison Ave., New York 59, N. Y.

REFINING

McBride Plant Is Sold To Lubbock Operator

Sale of the 2,500-bbl. skimming,, lube, and asphalt plant of McBride Refining Co. at La Blanca, Tex., to T. J. Coffey, Lubbock, was announced last week by President H. L. McBride.

Sale price was not disclosed by McBride, who said he will continue to manage the property for the next few months.

New Stills Being Added At Huge Gulf Refinery

Three new 20,000-bbl. crude stills are being built in the Gulf Oil Corp. refinery at Port Arthur, Tex., to replace obsolete equipment.

Also under construction, according to the company's annual report, are a 32,000-bbl. polyform unit and an experimental pilot plant to study desulfurization of crude oil.

The Port Arthur plant has a daily crude capacity of 192,000 bbl. and a cracking capacity of 98,000 bbl. According to the report, total processing capacity of Gulf refineries at the end of 1946 was 351,700 bbl. daily, an increase of 39,100 bbl. daily over that of the previous year.

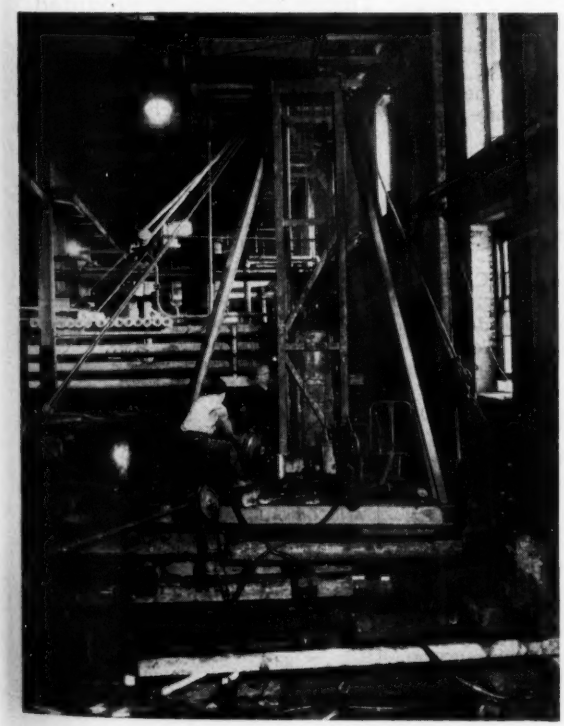
Socony-Vacuum Contracts For Casper Modernization

Catalytic Construction Co., subsidiary of Houdry Process Corp., has received a $3,500,000 contract for modernization and expansion of the Socony-Vacuum Oil Co., Inc., White Eagle Division refinery, at Casper, Wyo.

The contract involves the engineering and construction of another Houdry Thermofor catalytic-cracking unit with a fresh-feed capacity of 4,000 bbl. daily and will represent the fourth small-scale postwar T.C.C. unit to be built by industry.

In addition to the T.C.C. unit, the contract includes a feed-preparation system, gas plant, gas-purification unit, catalytic-polymerization unit, and extensive alterations to existing equipment.

T. Ellwood Webster, president of Catalytic Construction, who made the announcement, indicated that work involving engineering and procurement of materials has begun and work

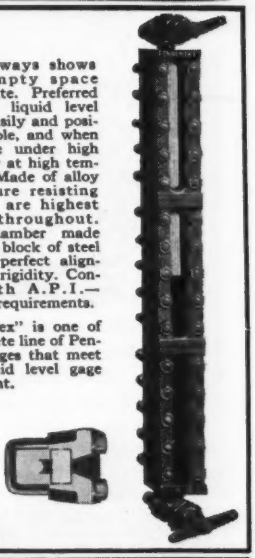


Sinking of 33 piles for a 495-ton-capacity foundation for compressors in this low-ceiling paraffin engine room of the Point Breeze refinery of Atlantic Refining Co., brought about the development of the unique pile driver in operation here. The job called for sinking of 40 to 50 ft. hollow steel shells of 12-in. diameter and filling them with concrete. The rig was assembled on the job and provided with a 3-ton, air-operated hammer. Because of the length of the hammer, the shells were driven in lengths of 10 ft. About 1,000 ft. of 12-in. pipe was used. (Copyright 1947, Atlantic Refining Co. Used with permission)

PENBERTHY
"REFLEX"
DROP FORGED STEEL
LIQUID LEVEL GAGES

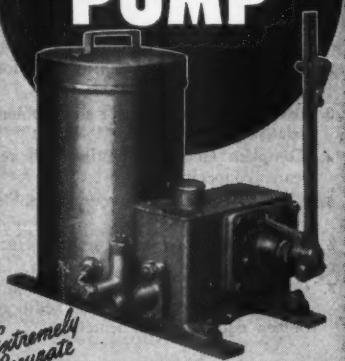
Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

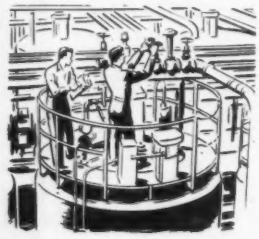
McCORD
TYPE "C"
CHEMICAL MEASURING
PUMP



Extremely Accurate
DEPENDABLE
Accuracy of delivery in McCord chemical pumps is the result of a finely engineered design with a minimum number of parts. Dependability is insured because working parts are fully enclosed, protected from dirt and the elements. Specify McCord. For sale by National Supply Co.

Standard of the Oil Fields
McCORD
CORPORATION, DETROIT 11, MICH.

With
PETRECO
DESALTING
more profitable
operations
don't "just happen!"



When an appreciable increase in
Refining Capacity
follows the installation of a
Petreco Desalter
it's not a coincidence . . .
it is planned and expected.

Long experience with many desalters, in many refineries, has shown that the

ELIMINATION OF SALT PLUGGING
REDUCTION OF HCl EVOLUTION
CURTAILMENT OF HARD COKING
ELIMINATION OF SCALING
And LOW SALT CONTENT CHARGES TO CRITICAL EQUIPMENT

which result from Petreco Desalting, invariably reduce shut downs and equipment failures so that the refinery gains by

MORE TIME ON STREAM
LESS DOWN TIME FOR REPAIRS
MORE PRODUCTIVE EQUIPMENT USAGE
in short: MORE CAPACITY

These benefits to operations are very significant, but they don't "just happen." These benefits, and the efficiency of Petreco Desalting result directly from

PETRECO SERVICE *which provides*

1. Service engineers on 24-hour call in all refining areas.
2. An experienced engineering staff for design and supervisory aid.
3. Advisory consultation for any problem relative to desalting.
4. Complete laboratory testing and research cooperation.
5. Special desalting equipment available from Petreco stock.
6. Construction supervision to direct erection of desalter.
7. Continuing equipment modernization through the development and addition of new equipment refinements.

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Plan Desalting Profits with
PETRECO

P47-3c

in the field is expected to start in August.

Other projects soon will double the present capacities of two other large refineries.

The Texas Co. is completing its expansion program and is expected to have a crude capacity of more than 10,000 bbl. daily with the installation of new units.

Work is scheduled to get under way May 1 on the installation of new units in the Standard Oil Co. of Indiana refinery, which now has a capacity of 12,000 bbl. daily.

New units in all the refineries are expected to utilize more efficiently the black oils in the Rocky Mountain region, providing for increased gasoline yields.

Work to Start Soon on New Reforming Unit

Work will start about May 1 on the foundations for a Phillips catalytic reforming unit to be installed in the plant of Rock Island Refining Corp., Indianapolis.

Contract for the engineering work was let in early February to Koch Engineering Co. Construction, to be done by company personnel, is expected to be completed early in 1948. The new unit will have a capacity of 4,000 bbl. daily.

Quaker Lubricating-Oil Plant Sale Announced

OMAHA, Neb.—Sale of the lubricating-oil plant of Quaker Petroleum Co. to Farmers Union State Exchange of Omaha, effective June 1, was announced last week by R. E. Pierce and Marshall McArthur.

Pierce and Marshall said they will continue to own and operate Paraland Oil Co.

Humble Under Way On Lubricating-Oil Plant

Humble Oil & Refining Co. will spend about $5,600,000 on its new lubricating-oil plant, now under construction at its Baytown, Tex., refinery, according to the company's annual report.

In 1946 the company spent $11,000,000 for new refinery facilities. Largest amount was for the purchase of the Baytown Ordnance Works from the Government. The plant, built and operated by Humble, now is being used to manufacture solvents and to improve gasoline quality. During the war it supplied toluene.

Humble refineries at Baytown and San Antonio ran an average of 202,400 bbl. daily to stills in 1946, an average of 12,000 bbl. daily above that of the previous year. Total runs of the company dropped during the year, however, because of the idle Ingleside refinery, abandoned because of its inability to manufacture high-quality products after conversion of facilities during the war to manufacture synthetic-rubber components.

Atomic Ship Engines Seen in Near Future

WASHINGTON. — Atomic power units suitable for driving warships will be available in less than 10 years, Dr. W. K. Lewis, dean of chemical engineering at Massachusetts Institute of Technology, declared last week before the commerce committee of the House of Representatives.

Lewis said the decomposition of a pound of uranium produces as much head as 36,000,000 cu. ft. of natural gas and 3,000,000 lb. of coal.

Reserves of both gas and oil, he said, can be extended more than 1,000 years by making both from coal.

Plant Contracts Awarded By California Standard

Standard Oil Co. of California has awarded a contract to Raymond Concrete Pipe Co. for the sinking of nearly 6,000 piles preliminary to construction of a new grease works at its Richmond, Calif., refinery. Additional work on the plant will be deferred until materials shortages are eased. The construction will be done by Barrett & Hilp Co., San Francisco.

Thiophene Study Provided

The Texas Co. has established a fellowship at Northwestern University for the study of the fundamentals of thiophene chemistry. Prof. R. K. Summerbell, chairman of the department of chemistry of the university, said it is hoped the fellowship will further studies of the basic material and the chemistry of organic reactions in which thiophene or its derivatives play a part.

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(SINCE 1915)
LININGS FOR
BUBBLE TOWERS • SETTLERS • STILLS • SEPARATORS • TANKS • AND VESSELS OF ALL TYPES • ENCASING AND FIREPROOFING STRUCTURAL STEEL AND PIPE • LINING WATER RESERVOIRS, DITCHES, DRAINS AND CANALS • REPAIRING DISINTEGRATED CONCRETE AND OTHER MASONRY.
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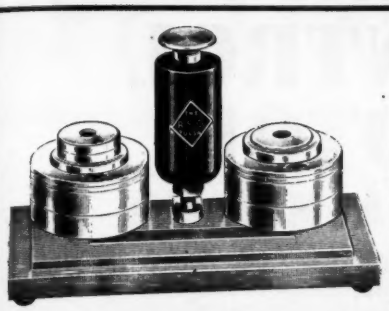
ACCURATE TESTING EQUIPMENT for FIELD and PLANT



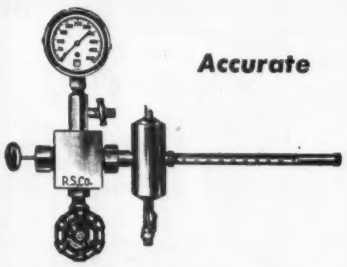
DEAD-WEIGHT GAUGE

Can be put on a line at any connection where ordinary gauge is placed. Gives exact pressure in line by actual dead weight.

R. S.

PLUMB BOB THERMOMETER

Serves THREE purposes: To carry the tape down; to read temperature of the oil; to measure the water in bottom of the tank. Complete with thermometer. Range — 20 to 120F.



DEW POINT TESTER

Simple to operate. Dew points can be determined with an accuracy of 0.2F., even on high pressure gas transmission lines. Standard range is 0 to 500 P.S.I.

"COMPLETE LINE OF SCIENTIFIC LABORATORY EQUIPMENT"

Write for Catalog No. 30-A

THE REFINERY SUPPLY CO.

Main Office and Plant

621 E. 4th Street **TULSA 3, OKLAHOMA** Ph. 4-8144, L.D. 581

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can you identify

this oil product?

The new "soapless" soap—used for washing dishes and clothes—is one of many startling new products made from oil. You got it right if you identified the oil derivative in these new cleansers as *sodium alkyl aryl sulfonate!*

can you identify

good ROPE?

Identify rope by the name *New Bedford* (an easier name to remember!) and you'll be right, too. New Bedford Rope has been preferred by many oil men since the first well was drilled. Like a lot of other good things, New Bedford Rope may be a little hard to get right now, but keep asking for it . . . *by name.* Meanwhile, take good care of the New Bedford Rope you've got.

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NEW BEDFORD CORDAGE CO.

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VICTOR *Custom* FASTENINGS

The manufacture of custom fastenings from any material to any specifications has been our business for 34 years.

VICTOR Studs and Bolts are made to *your* specifications of strength and resistance to corrosion and heat. May we quote on your requirements?

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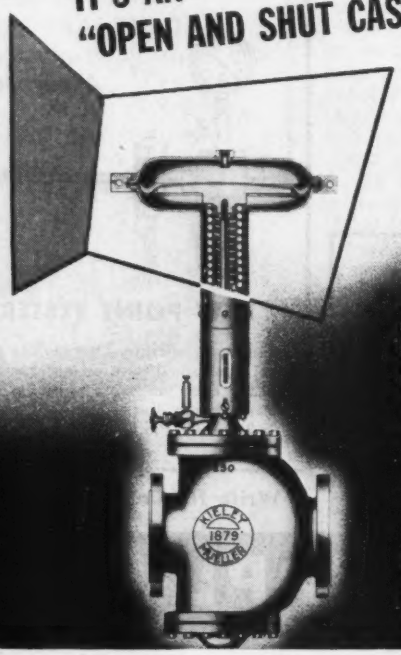
IT'S AN "OPEN AND SHUT CASE"



for K&M's Revolutionary

KONTROL MOTOR DIAPHRAGM VALVE

Just two simple quick-acting clamp screws to loosen, and your diaphragm casing is off. Tight-sealing clamp ring eliminates multiple bolts completely. Duo-seal molded diaphragm lips are automatically self-sealing.

67 years of control engineering "know how" produced this revolutionary new KONTROL MOTOR . . . featuring these design innovations:

- Pressed Steel Diaphragm Casing . . . lighter . . . tougher, more durable.
- Rigid Welded Steel *Tubular* Yoke.
- Long calibrated Steel spring . . . fully enclosed.
- Enclosed ball bearing Spring Adjusting Screw.
- Streamlined Flow Valve Body with high capacity . . . unrestricted flow areas.
- Super-finished Disc Guides, *honed* guide bushings, top and bottom . . . for minimum friction; increased life.

Used with air operated instruments or auxiliary pilot units, the K & M KONTROL MOTOR regulates the flow of steam, liquids or gases — efficiently and sensitively. Send us your control problems. We'll show you how the KONTROL MOTOR valves will solve them. Write for new KONTROL MOTOR bulletin.

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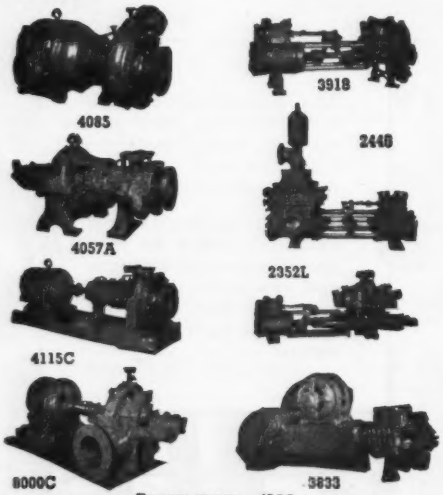
Since 1869



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DEAN BROTHERS PUMPS INC.

INDIANAPOLIS IND.

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STRETCH **LIFE and**
SHRINK **WEAR in Engines—**
USE

MARVEL MYSTERY OIL

Oil field engines run long—and hot! Wear is greater, life is shorter—unless you give special care. Top cylinder lubrication is your easiest way to add years of extra service to the life of any engine.

Marvel Mystery Oil and the Marvel Inverse Oiler are positive protection for oft-neglected parts—in the vital upper-motor area! Extra-tough Marvel armors valves and guides with super-strong film that resists sizzling heat. Besides, Marvel cleans as it coats—strips off sticky gums and varnish—keeps internal surfaces cleared and clad for action.

Proper lubrication adds life and power, saves time and trouble. Ask for the facts. Emerol Mfg. Co., Inc., 242 West 69th Street, New York 23, New York.

use the

MARVEL

INVERSE OILER WITH MARVEL MYSTERY OIL

The Marvel Inverse Oiler, easily installed, proportions the flow of Marvel Mystery Oil precisely to the needs of your engine.

PIPE LINES

Magnolia Lets Contract for 178-Mile Products Line

Magnolia Pipe Line Co. has awarded contract to Smith Contracting Co. for construction of 178 miles of 12¾-in. products pipe line between Beaumont and Hearne, Tex. This is the southern part of the system planned by Texas Pipe Line Co. and Magnolia for a products line from Gulf Coast refineries to the Dallas-Fort Worth area. The part of the line to extend north from Hearne is to be built by Texas Pipe Line Co.

Work on the project at the section contracted from Magnolia by the Smith organization is expected to start in the first half of May. The contractor is considering Liberty, Tex., as the location of the field office. For this job contractors operations are being handled by F. A. Smith, superintendent; J. H. Smith, purchasing agent, and C. C. Craig, spread man.

Wyco Awards Contracts For Casper-Denver Line

Wyco Pipe Line Co. has awarded contracts for building a 260-mile 8-in. products pipe line from Casper, Wyo., to Denver, Colo.

The northern part, designated as Job 1 and extending 132.84 miles from Casper to a point 40 miles north of Cheyenne, Wyo., has been let to Allred-Enix Construction Co. Job 2 for the southern part of the line, extending from Job 1 to Denver, was awarded to Pacific Pipe Line & Engineers, Ltd. Stringing of pipe has been contracted by Wyco as follows: Job 1, by Tom Weadick; Job 2 by J. L. Cox & Son.

Early this week more than 160 miles of 8-in. pipe was on the ground. Pipe laying will start southward from the northern ends of Job 1 and Job 2. Contracts specify that the project should progress at the rate of a mile a day. In addition to the main line construction of 8-in. line, Job 1 also includes 7⅓ miles of 6-in.

Engineering and supervision of construction of the Wyco project is being handled by Stanolind Pipe Line Co.

Rocky Mountain Plans Line-Expansion Project

Expansion of its Lance Creek-Cheyenne-Denver crude-oil line is planned by Rocky Mountain Pipe Line Co., affiliate of Continental Oil Co., as soon as pipe is available.

The line, laid in 1938, is composed of 136 miles of 8-in. pipe between

At the microphone is Ing. Julio V. Canessa, administrator, Argentine State Gas Service Department, delivering a nation-wide radio address on the occasion of the inauguration of construction of the 1,200-mile natural-gas pipe line from Comodoro Rivadavia to Buenos Aires. At his left are President and Mrs. Juan D. Perón

CRC

PIPE LINE CONSTRUCTION EQUIPMENT

CRUTCHER-ROLFS-CUMMINGS
Pipe Line Equipment and Materials
Houston-Tulsa

ANDERSON BROTHERS
Pipe Line
Contractors and Engineers
707 NORTH DRENNAN
HOUSTON, TEXAS

. . . . . with MODERN, EFFICIENT EQUIPMENT . . . AND PLENTY OF IT!

above all EXPERIENCE

Not just Contractors but

PIPE LINE SPECIALISTS

IT HAS TO BE
OK
IF
OKLAHOMA
CONTRACTING CO.
INC.
DOES IT
MERCANTILE BANK BLDG.
DALLAS, TEXAS

Lance Creek and Cheyenne, and 96 miles of 6-in. pipe between Cheyenne and Denver. The company plans to replace the 6-in. line with 10-in. pipe and to loop the line from Guernsey Junction with an additional 8-in. line.

Capacity of the line was increased 2 years ago by addition of pump facilities, and the line now is delivering about 5,000 bbl. daily to refineries. Completion of the project will allow more crude from Rangely and other northwestern Colorado fields to be shipped directly into Denver and will allow more crude from Wyoming fields to be furnished Cheyenne and Denver refineries.

Williams Brothers Forms New Overseas Company

Williams Brothers interests in the contracting of 450 miles of 30-in. pipe, stations, and port facilities for Trans Arabian Pipe Line Co. will be handled through an organization known as Williams Brothers Overseas Co. Kenneth Owen, assistant manager, will be concerned with business of the company in the United States which he will attend to at the recently opened office of the firm in San Francisco as well as company offices in Tulsa and New York.

During a recent trip to Egypt, Turkey, Syria, Trans Jordan, Arabia, and Saudi Arabia, David R. Williams and Guy S. Connors, vice presidents of the company, went over the route of the firm's section of the Trans Arabian line by both airplane and automobile.

At present, Williams Brothers interests are engaged in six countries outside the United States and soon will have operations in other countries. South American undertakings are handled by Williams Brothers Co.; Canadian operations by Williams Brothers Construction Co.; and United States operations by Williams Brothers Corp.

To facilitate contact between projests in the western hemisphere, Williams Brothers interests have contracted for purchase of an A-26 type airplane. All transportation of men and materials for contractors will be furnished by Trans Arabian Pipe Line Co. for its construction projects.

Eastern Venezuelan Facilities Are Extended

Plans for Socony-Vacuum Oil Co., Inc., have been modified to provide for its 12-in. crude-oil pipe line now under construction in Eastern Venezuela to extend into Puerto la Cruz. This line is being built to move oil from the Greater Oficina and Greater San Joaquin producing areas.

According to earlier announcements the line was scheduled to be a 77-mile line which would connect with

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PIPE COATING and WRAPPING MACHINES
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SCHRAMM AIR COMPRESSORS
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Everything for the Construction and Maintenance of pipe lines
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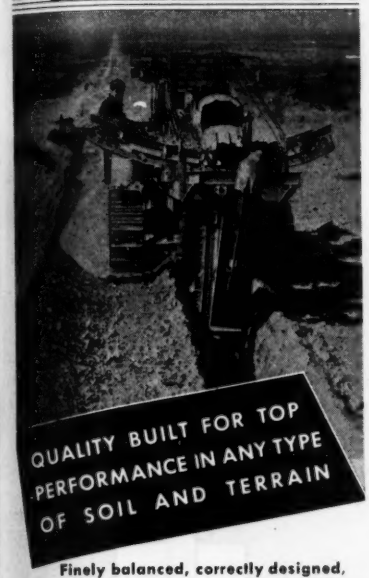
Tulsa, Oklahoma

CLEVELANDS



Finely balanced, correctly designed, powerful, rugged, fast and highly resistant to wear and abuse "CLEVELANDS" represent the utmost in trenching economy and efficiency.

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PIPE LINES

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S. E. HUEY & CO.
ENGINEERS & SURVEYORS
OUACHITA BANK BLDG.
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

the line of Cia. Consolidada de Petroleo at a point 23 miles southeast of Puerto la Cruz. The present intention is that the line will be 100 miles long.

For the northernmost 23 miles it will parallel the line of Cie. Consolidada. Approximately 10 miles of pipe has been laid. Pipe for the project is being shipped from the United States.

In addition to laying pipe for this Socony-Vacuum project, the contractor, Williams Brothers Co., is moving dirt for tank grades for Texas Petroleum Corp. at a new port site at a small bay west of Guanta in the Puerto la Cruz area where the marine terminal, planned for serving a future crude oil pipe line from the Las Mercedes field in the state of Guarico, is to be located.

New-Project Activity Increasing in East

For laying 50 miles of 20-in. pipe for United Gas Fuel Co. in West Virginia, Williams Brothers Corp. has moved Thelma Davis and Edward Peters, superintendents, from Oklahoma, where they have recently completed 120 miles of 8-in. line for Great Lakes Pipe Line Co., Sunray Oil Co. and Wilcox Oil Co.

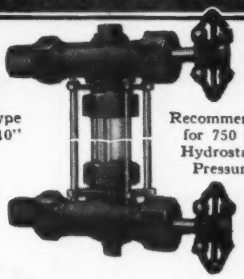
For projects with more than 300 miles of pipe to be laid, on which construction will be started in Pennsylvania and West Virginia within a few weeks, this contracting firm has been transfering superintendents to this region, including A. T. Maxwell, Ralph Getty, Whitey Martin, and O. R. Mitchell. Operations there are being directed by G. A. Manuel. Other undertakings of this contractor in the East include the following.

In connection with the construction of 43 miles of 20-in. line for East Ohio Gas Co., two gangs are being supervised by John Poston, superintendent. A warehouse is maintained by the contractor at Barberton, Ohio. In addition to the 43-mile project for East Ohio, the laying of 20 miles of pipe for diameters less than 20-in. has been contracted.

For Louisville Gas & Electric Co.'s work in the Muldraugh field and elsewhere in Kentucky, this contractor operates gangs from headquarters at 1146 River Street, Louisville, Ky. These are directed by John C. Virgin, superintendent, who also has charge of work of Williams Brothers Construction Co. for Imperial Oil Co., Ltd., now going on at Sarnia, Ont., and other work to be started later at Montreal, Que.

Two crews are engaged in work for Atlanta Gas Co. Williams Brothers has converted its large warehouse at Chamblee, Ga., originally established during construction of Plantation Pipe Line Co., so that now it is used for aluminum fabrication of windows and houses.

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



Type "10"

Recommended for 750 lb. Hydrostatic Pressure

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

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to be sure

Yes, for dependable pipelne construction contract with Morrison Bros. Experienced construction men and modern equipment are doing your job. This combination of personnel, equipment, and dependability mean "Pipeline Perfection."

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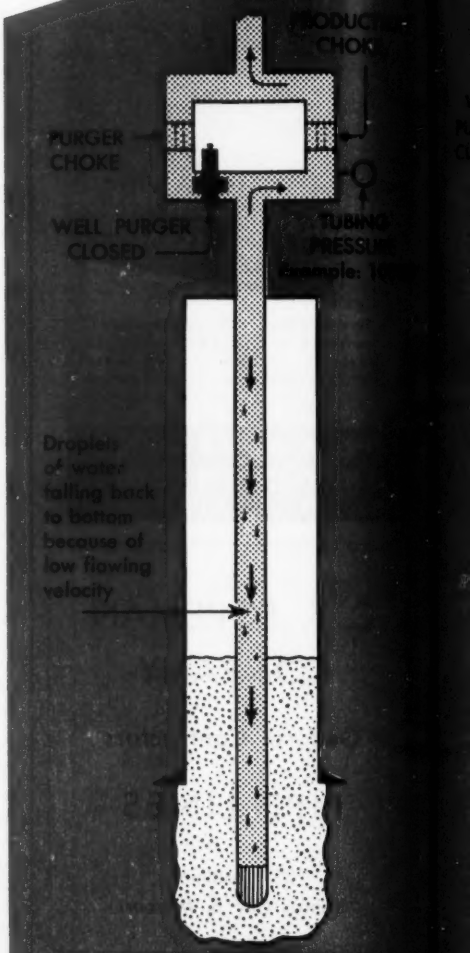
Here's how the "OMSCO" WELL PURGER (PATENTED) works . . .

If your well makes water . . . you need it!


PRODUCTION CHOKE
PURGER CHOKE
WELL PURGER CLOSED
TUBING PRESSURE
Droplets of water falling back to bottom because of low flowing velocity
WELL FLOWING ON PRODUCTION CHOKE AT RATE OF DAILY ALLOWABLE

Study the four sketches at the right — they illustrate the complete cycle of the action of the "Omsco" Well Purger.

By the use of this automatic purger, the flowing life of a well is lengthened — manual purging is never required — expensive swabbing jobs eliminated.

One swabbing Job costs more than an "Omsco" Well Purger.

Thoroughly proven on hundreds of wells.

Contact your nearest Wilson Supply Store or write.

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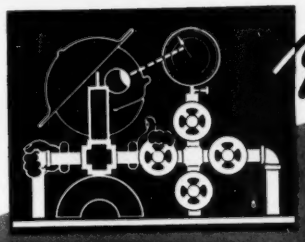


Your MECHANICAL SWITCHER

WELL PURGER CLOSED

Water accumulating at bottom causes tubing pressure to drop

Water accumulating in bottom of tubing

WELL LOADING UP WITH WATER

WELL PURGER OPEN

Purger opens when tubing pressure drops to predetermined point. This allows well to flow through both production and purger chokes

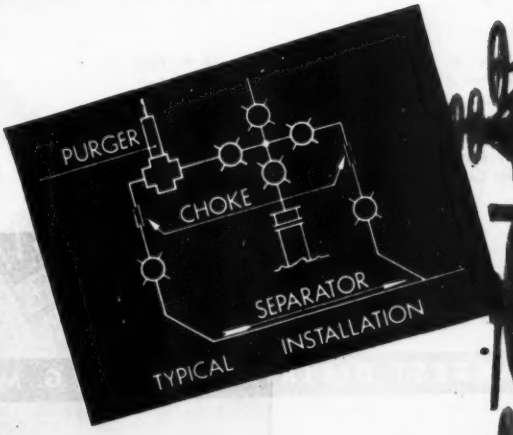
WELL PURGER OPENS
Flow velocity in tubing increases, which carries accumulated water out of well

WELL PURGER CLOSED AGAIN

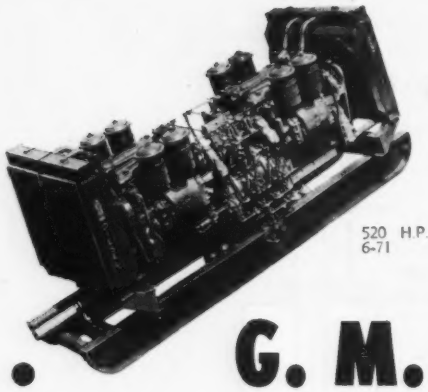
TUBING PRESSURE BACK TO 1000#

Droplets of water accumulating in bottom of tubing. When tubing pressure drops to predetermined point again, purging cycle will be repeated

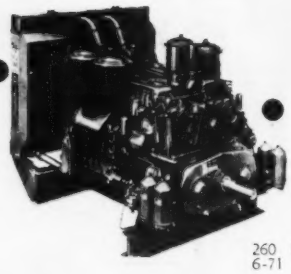
WELL FLOWING ON PRODUCTION CHOKE AT RATE OF DAILY ALLOWABLE



The small drawing to the right shows the simplicity of installing the "OMSCO" Well Purger. Once installed — no further attention or adjustments required.



520 H.P., Quad 6-71



260 H.P., Twin 6-71

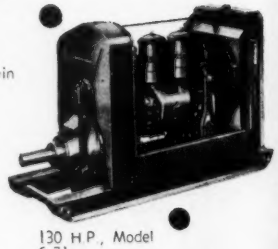
G. M. DIESELS

Installed by

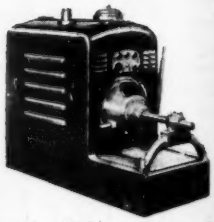
STEWART & STEVENSON SERVICES

Provide Top Performance with Maximum

PARTS INTERCHANGEABILITY

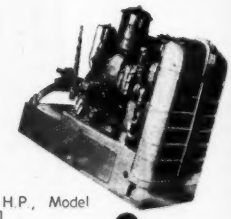


130 H.P., Model 6-71



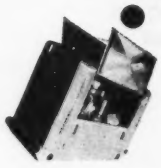
87 H.P., Model 4-71

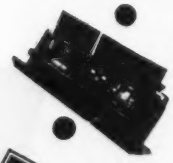
● No matter if it is a 520 H.P. Diesel drilling engine or a small 10 K.W. rig lighting plant, the same piston fits them all because practically all parts are interchangeable no matter what size engine you select, if it is a series 71 General Motors Diesel. Whatever your requirements may be, we have a dependable G. M. Diesel to fit the job. Prompt delivery on power units, utility units, rig lighting plants, switch boards, and all models of G. M. Diesel engines! Write or phone for full information.



65 H.P., Model 3-71

43 H.P., Model 2-71





10 K.W. to 30 K.W. Rig Lighting Plant

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Auxiliary Combination—generator set, air compressor, accessory drive, pump, electric welder

Anywhere... **PARTS • SERVICE** *...Anytime*

THE NATION'S LARGEST DISTRIBUTORS OF G. M. DIESEL ENGINES

NATURAL GAS

Consolidated Plans Huge Expansion Expenditures

Consolidated Natural Gas Co. will spend approximately $50,000,000 during 1947 and 1948 for additional facilities to meet "customer demands reaching levels . . . beyond the capacity of present facilities," according to the annual report of the company.

In a breakdown of the figure the company said it will spend for: Production facilities, $11,000,000; underground storage, $1,000,000; transmission facilities, $23,000,000; distribution facilities, $13,000,000; and general, $2,000,000.

Considerable material has been promised for 1947 delivery, the report said, but added that the difficulty of obtaining pipe and other material might force some changes or delays in the program.

Hulcy Outlines New Lone Star Expansion Program

DALLAS.—Lone Star Gas Co. will spend more than $9,500,000 for additions to its physical properties, D. A. Hulcy, president, told stockholders at the company's annual meeting last week.

Broken down, the program calls for the following expenditures: Leases, drilling and production, $2,560,230; gathering and transmission pipe lines and appurtenances, including compressor stations, $1,732,100; and distribution mains, extensions and appurtenances, $3,279,513.

Additions to gasoline and cycling plants would cost an estimated $1,071,650, and miscellaneous expenditures, including automotive equipment, tools, etc., were estimated at $986,105.

United Asks Approval of $57,000,000 Project

WASHINGTON.—United Gas Corp., Shreveport, late last week filed application for authority to construct 1,500 miles of main transmission lines for natural gas in five southeastern states. United said the project would require about a year to complete and estimated the cost at $57,000,000.

Originating in Mississippi, the new system would have main lines running through southern Alabama, northern Florida, southern Georgia and southeastern South Carolina. Terminals, the company said, probably would be at Georgetown, S. C., and Jacksonville, Fla.

Exact route of the proposed lines was not indicated, the company said, because of incomplete surveys to determine which towns and cities will be served.

The new lines, the company said, will be supplied with natural gas from the integrated system of United Gas Pipe Line Co., which is connected to about 1,650 wells in 124 gas fields in three states. Proven reserves in those fields, the company asserted, are approximately 13 trillion cubic feet.

New Carbon Black Aids Production of Rubber

NEW YORK.—A new furnace carbon black, Statex K, which is equal or superior to conventional channel black and which shows the highest resistance to heat, aging, and to flex cracking of rubber made with it, has just been announced by R. L. Carr, president of Columbian Carbon Co.

The new black is formed by injecting hydrocarbon feed gas into a strong blast flame so that conversion occurs in a fraction of a second after the hydrocarbon reaches the flame, Carr stated. A single furnace occupies 400 sq. ft. and yields as much black as 35 of the old-fashioned channel houses, and producton conditions can be controlled with an exactness unknown in earlier processes.

The new process makes a large saving in gas consumption, requires less than half as much steel as older processes, and a million pounds sold to the rubber industry at a premium price has proved superior performance in the rubber produced, it is stated.

Approval Sought for Austin-Detroit Line

WASHINGTON. — Approval of an application for authority to construct a 150-mile natural-gas pipe line from the Austin storage fields in Mecosta County, Michigan, to Detroit, has been asked of the Federal Power Commission by Austin Field Pipe Line Co.

Charles V. Shannon, company representative, said the line would cost $8,000,000 and would tie the Michigan-Wisconsin pipe line, extending from Hugoton field in Kansas to the Austin storage fields, to the Detroit area.

Northern Natural Plans New Compressor Station

GARDEN CITY, Kans.—A 10,000-hp. compressor station and dehydration plant will be constructed here immediately to move natural gas along a recently authorized 320-mile pipe line to distribution facilities at Palmyra, Neb., Northern Natural Gas Co. announced last week.

The plant is expected to add 173,000,000 cu. ft. daily to the present capacity of Northern Natural's lines out of Hugoton field. It will feed a 26-in. pipe line.

Gas-Measurement Short Course to Begin May 6

Sixty individual classes in various phases of gas measurement are scheduled for the Southwestern Gas Measurement Short Course, to be held at University of Oklahoma, Norman, May 6-8.

The morning of each of the 3 days will be devoted to general sessions, with the afternoons to be filled with separate classes on the many problems involved in gas measurement.

Speakers on the program of the general sessions will include D. A. Hulcy, president, Lone Star Gas Co.; Kenneth R. D. Wolfe, Fisher Governor Co., speaking on "Fundamental Principles of Regulators;" A. F. Benson, American Meter Co., Inc., "Fundamental Principles of Orifice Meters;" and E. R. Gilmore, Pittsburgh Equitable Meter Division of Rockwell Manufacturing Co., "Fundamental Principles of Displacement Meters."

Natural Gasoline

Keystone Field to Get Natural Gasoline Plant

MIDLAND.—Plans for construction of a natural-gasoline plant in Keystone field of north Winkler County, West Texas, have been announced by Richardson & Bass, Fort Worth operators. The proposed plant would take flare gas from wells in Keystone field.

Dry gas would be returned to El Paso Natural Gas Co.'s pipe-line system, which was said to be lining up large volumes of such gas for transmission to Calfornia through the new 24-in. line now under construction from Jal, N. M., to Los Angeles, and which will run feeder lines to a number of Permian basin fields.

TIME-TESTED QUALITY

EVER since Spindletop, Lone Star Cement has been a leader in oilfield service. Since 1927, 'Incor'* has held the top spot in the "quick set" field. And since 1936, 'Starcor'* has been doing an outstanding job in deep wells, where dependable slow-setting properties are needed. Performance is the ultimate test of quality . . . and it is *time-tested* quality that argues the use of LONE STAR Cements. Select the one that fits your job. *Reg. U.S. Pat. Off.

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Exploration and Drilling

Heavy Rigs Moved Into Mississippi

MISSISSIPPI'S oil history to date has been a series of ups and downs, nothing done by halves. Currently it is in the midst of an upswing that has resulted in one of the greatest concentrations of very deep drilling rigs in one spot. There are over 49 heavy rigs now in Brookhaven field, Lincoln County, where the pay is found between 10,000 and 10,500 ft.

Brookhaven lies about 40 miles almost due east of Cranfield pool, and about 70 miles almost due south of Tinsley. Present activity is largely in an area about 6 miles long by about 3 miles wide, in the western half of Townships 7 and 8 North, Range 7 East. The pay zone is the Massive sand of the Lower Tuscaloosa, on an anticlinal structure which probably reflects a deep-seated salt dome, as do so many of the structures in this part of the Mississippi salt-dome basin.

The gravity of the oil varies from 27° to 37° gravity, which puts it into the light-oil group of Mississippi fields. The discovery well was completed by The California Co. in March 1943 as a pumper and there was little interest in the field for a long time. The second well was completed and put on production in August 1945, more than 2 years later. Then the development campaign began to gather momentum slowly.

The third well was completed in January 1946, and four more wells were completed by the end of June. During the last half of 1946 almost three times as many wells were completed as in all the pool's previous history; the end of the year finding a total of 27 producers.

By that time, too, the size of the pool was apparent, and the average production of over 400 bbl. per day per well looked good in spite of the depth. With many 10-year leases due to expire this summer, the result was a flurry of farmouts, and a rush to get heavy rigs into the field to start drilling before lease-expiration dates.

In February the operators agreed to establish, temporarily, a total field allowable of 8,000 bbl. per day. The allocations to each well are based on its aggregate sand thickness and the differential between current bottom-hole pressure and original pressure. This trial measure is subject to revision as engineering studies indicate changes should be made. This action was taken because of a disappointingly rapid decline in bottom-hole pressures in the area of most concentrated development.

PERMIAN BASIN

Crane County Discovery Finds Pay in Ellenburger

MIDLAND.—Gulf Oil Corp.'s Crane County discovery, 1-HH University, found additional pay in the Ellenburger, and on a drill-stem test at 10,799-850 ft., open 1 hour and 38 minutes, recovered 238 bbl. of oil. There was gas to the surface in 7 minutes and oil started flowing in 34 minutes. In the first 30 minutes of flow into tanks, it made 29 bbl. of oil. The second 30-minute period produced 40 bbl. of oil. Tool was then closed and it continued to unload oil. The 238-bbl. figure was an estimate of the total amount allowed to flow into pits, recovery from drill pipe, and the amount put into tanks. Gas volume was estimated from 850,000 to 1,152,000 cu. ft. per day. Operators were to drill another 50 ft. before making further tests.

This well had previously shown for production from the Devonian, Silurian, McKee, two horizons in the Waddell, and also made a flow of oil from the Ellenburger at 10,588 ft. Location is 1,980 ft. from east and 2,054 ft. from north lines of Section 3, Block 31, University Lands, and nearly 4 miles north and slightly east of production in Block 31 field.

Gulf's 421-E Goldsmith, Section 15, Block 44, T&P Survey, Devonian discovery in the Goldsmith field of Ector County, continued to flow oil with no trace of water. On the last 24-hour test, flowing through 9/64-in. choke, it made 121 bbl. of 37.3°-gravity oil, with a gas-oil ratio of 555:1 from perforations at 7,980-90 ft.

In west central Crockett County, 4 miles northeast of Fort Lancaster, Gulf's 1-R University was given a completion potential of 108.48 bbl. of oil a day, pumping. Oil is 33.3° gravity and gas-oil ratio was 591:1. Grayburg pay was found at 1,677 ft. Gulf has filed application to drill a south and east offset to the discovery.

In Coke County, Sun Oil Co.'s 1 Fred Jameson was completed as the second Strawn producer in Jameson field, flowing, naturally, 247.96 bbl. of 47.2°-gravity oil in 24 hours. Flow was through ¼-in. choke on tubing set at 6,156 ft., and from perforations at 6,165-6,230, ½,242-86, and 6,306-45 ft. On an elevation of 2,065 ft. this test was carried to the Ellenburger, topped at 7,045 ft., and bottomed at 7,130 ft.

In southwestern Andrews County, Sunray Oil Co. 1 Lockhart & Brown was apparently a failure in the Devonian, and was awaiting orders. A drill-stem test at 9,598-9,648 ft. recovered the water cushion, plus 225 ft. of drilling mud slightly cut with gas, and heavily cut with salty sulfur water.

Extensions to proven areas reported last weew included Stanolind Oil & Gas Co. 2-C W. F. Cowden, which completed for 149.36 bbl. of oil a day, to extend Clear Fork production ⅝ mile north of the Goldsmith field, Ector County. Devonian production was also extended ⅝ mile north-northwest of the TXL field at Shell Oil Co., Inc. and Arkansas Fuel Co. 2-D J. D. Slator, Jr.

WEST TEXAS SUCCESSFUL WILDCAT

Upton County: Marshall & Smith 1 Eva Mae Cole, Sec. 94, Blk. Y, F. Rooney Sur., 1 mi. E Crane-Cowden field, pumped 55 bbl. 32°-gravity oil in 24 hr., pay 2,816-35 ft., TD.

WEST TEXAS WILDCAT FAILURE

Cochran County: Superior Oil Co. 1 W. W. Cameron Estate, Greer CSL Sur., 6 mi. SE Morton, dry, TD 7,035 ft. in limestone, no shows, San Andres 3,760 ft., elev. 3,722 ft.

PANHANDLE SUCCESSFUL WILDCAT

Sherman County: Phillips Petroleum Co. 1 Cluck, Sec. 5, Blk. 3-B, GH&H Sur., 22 mi. SE Stratford, flowed 9,800,000 cu. ft. gas from perforations at 3,100-80 and 3,015-90 ft., TD 6,306 ft., PB 3,180 ft.

N. CENTRAL TEXAS

North Texas Deepest Test Plugging Back

WICHITA FALLS.—North Texas' deepest test, drilled as a "tight" well, last week was reported first plugging back to 9,860 ft., after running electric survey to 13,352 ft., total depth. Casing perforations at 9,800-20 ft. resulted in a recovery of 540 ft. of salt water on a drill-stem test. It was again plugged back to 8,950 ft., and casing perforated from 8,870-8,940 ft. A 2-hour drill-stem test recovered 2,000 ft. of fresh water. Operators were bailing water down to test this horizon, reported earlier as hard sand having a show of oil.

A new shallow-sand pay for Holbert Caddo limestone field of Young County was reported at Warren Oil Corp. 1-C W. D. Kent, Block 720, TE&L Survey, 2 miles southwest of the town of Proffitt. The well flowed more than 25 bbl. of oil in 21 hours through 24/64-in. choke, from 2,963-68 ft., total depth. Warren was drilling ahead on a south offset to the discovery.

In southeastern Throckmorton County, about 2 miles northeast of the Graham-Magnolia field, Mudge Oil Co. 1 M. K. Graham flowed 108 bbl. of 41°-gravity oil a day through 9/64-in. choke, from perforations at 3,880-85 ft., in the Caddo limestone. The discovery was drilled to 4,702 ft. in the Mississippi limestone topped at 4,680 ft., but no commercial shows were found at that depth.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Archer County: L. T. Burns 2 Benson Estate "E," Sec. 1,398, TE&L Sur., 6 mi. SE Anarene, pumped 100 bbl. 43°-gravity oil a day, Caddo 4,454-4,600 ft., TD 5,231 ft.

H. W. Snowden Oil & Gas Co. 1 Dorothy Andrews, J. B. Hinds Sur., 4 mi. SE Anarene, Benson area, pumped 115 bbl.

Only RECTORSEAL gives you these advantages

1. Won't harden . . . won't freeze the connection.
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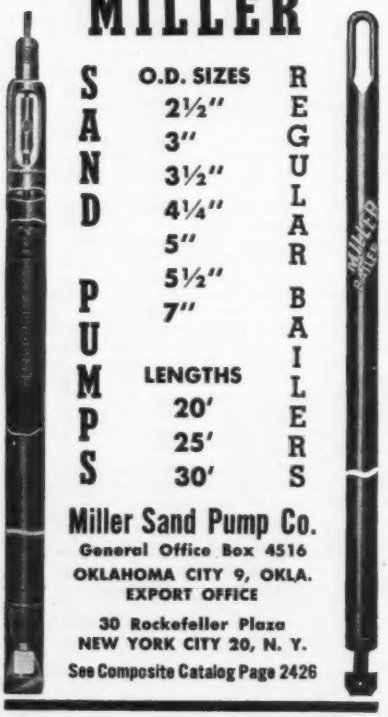

SAND PUMPS

O.D. SIZES	LENGTHS
2½"	20'
3"	25'
3½"	30'
4¼"	
5"	
5½"	
7"	

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OKLAHOMA CITY 9, OKLA.
EXPORT OFFICE
30 Rockefeller Plaza
NEW YORK CITY 20, N. Y.
See Composite Catalog Page 2426

43°-gravity oil a day, Caddo 4,591-4,601 ft., TD 4,850 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Baylor County: B.O.M. Oil Co. et al 1 Burrell Mills, Sec. 3,136, TE&L Co., Sur., 4 mi. W Megargel, dry, TD 1,545 ft. in shale.

Clay County: Lewis Breeden 1-A L. O. Wright & Co., Sec. 2,631, TE&L Co. Sur., 7 mi. SE Windthorst, dry, TD 900 ft.

Cooke County: Starr Oil Co. 1 Simpson, John Haggarty Sur., 1 mi. SW Woodbine, dry, TD 4,693 ft. in hard limestone.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Throckmorton County: Mudge Oil Co. 1 M. K. Graham Estate, Sec. 2,201, TE&L Sur., 4 mi. NE Woodson, Parrott area, flowed 108 bbl. 41°-gravity oil a day through 9/64-in. choke, casing pressure 1,020 lb., tubing pressure 490 lb., Caddo pay 3,880-85 ft., TD 4,702 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Jones County: R. H. Roark 1 Minnie L. King, N. Scott Sur. 16, 2 mi. S Lueders, dry, TD 1,690 ft., Dotham limestone 1,245 ft., Saddle Creek 1,603 ft.

Palo Pinto County: Fortex, Phoenix & Savage 1 S. J. Stuart & Sons "A," Sec. 50, Blk. 4, T&P Sur., 7 mi. SE Caddo, dry, TD 1,876 ft., sand with show of gas 1,856-58 ft.

Shackelford County: Humble Oil & Refining Co. 1 K. B. Green, Sec. 1,548, TE&L Sur., 11 mi. NE Albany, dry, TD 4,553 ft., Palo Alto 1,771 ft., Caddo 3,558 ft., Ellenburger 4,398 ft., elev. 1,207 ft.

EASTERN TEXAS

Arkansas Fuel Discovery Gets Travis Peak Pay

DALLAS.—Arkansas Fuel Oil Co. 1 M. C. McCauley, Harrison County discovery, 10 miles east of Marshall, was reported flowing by heads into tanks. Previously, operators swabbed oil, wash water, and gas, with the fluid level standing 2,000 ft. from the top. The well had been shut in 12 hours when it headed. Casing pressure had built up to 1,100 lb. and tubing pressure was 50 lb. Pay is from perforations in the Travis Peak at 6,446-52 ft.

Two gas-distillate discoveries were making further production tests. In Anderson County, Blue Bird Investment Co. 1 J. H. Pierson, 5 miles southwest of Elkhart, perforated the upper Woodbine at 5,504-20 ft., and on open flow made an estimated 25,000,000 to 30,000,000 cu. ft. of gas a day, and still testing about 4 bbl. of distillate per 1,000,000 cu. ft. of gas. Flow was through ¼-in. tubing choke, under 1,95 lb. pressure. In Harrison County, 10 miles southeast of Marshall, E. C. Johnston 1 Edna Hood had separator and tanks installed. First tests of the Travis Peak at 6,410-75 ft., open hole, made a small amount of gas with no distillate; then picking up a small amount of 58°-gravity distillate.

In Cherokee County, northwest of Maydelle, Standard Oil Co. of Texas 1 New Birmingham made new perforations in the Bacon limestone at 8,608-30 and 8,636-52 ft. Flowing through 5/16-in. tubing choke, under pressure of 3,200 lb., it made 6,150,000 cu. ft. of gas and 31 bbl. of fluid, including some water, in 24 hours.

EAST TEXAS WILDCAT FAILURES

Bowie County: Tide Water and Seaboard Oil Co. 1 Dalby & Joiner, Douglas Puckett Sur., SW cor. of county, dry, TD 4,825 ft., sample tops: Nacatoch 725 ft., sub-Clarksville 3,286 ft., Woodbine 3,616 ft., Paluxy 4,521 ft., no shows or porosity.

Houston County: Continental Oil Co. 1 Texas Long Leaf Lumber Co., N. Lynch Sur., 13 mi. SW Crockett, dry, TD 8,530 ft., sample tops: Midway 4,958 ft., Navarro 6,290 ft., Austin 7,670 ft., Woodbine 7,924 ft., salt water in sand at 7,938 ft.

SOUTHWEST TEXAS

Initial Tests Made on Frost Field Discovery

CORPUS CHRISTI.—Dee Davenport 2 fee-State, discovery well of new oil production in the area 2 miles north of Frost field in southeastern Starr County, flowed an estimated 4 to 5 bbl. of 48.6°-gravity oil per hour through a 9/64-in. choke, on test through perforations at 4,182-92 ft. Tubing pressure 365 lb., casing 500 lb. Oil sand was cored at 4,172-98 ft. with total depth of 4,205 ft. Well is 2,300 ft. northeast of Davenport 1 fee-State discovery gas-condensate well at "Davenport" field.

The best oil production so far encountered at West Sinton field, in San Patricio County, is indicated in Jones & Morgan 3 A. L. Sims, discovery well in a deeper pay zone. This well is in F. J. Welder Subdivision, Block 15. Drilled to a total depth of 5,186 ft., this well flowed 168 bbl. of oil per day through a ⅛-in. choke from perforations at 5,136-46 ft. The deepest previous production was from the 3,460-ft. level, which produces oil and salt water.

New oil production is being developed in two sectors of the Stratton field "gas cap" area, in southwest corner of Nueces County. Chicago Corp. 73 Wardner is flowing oil through perforations at 7,184-85 ft. on initial production test, to be the first oil production from this zone in this part of the field. Total depth is 7,551 ft. this well is located in Section 13, Stratton Subdivision, Paso Ancho de Abajo Grant.

A new pay zone for South Haldeman field, Jim Wells County, is indicated at Magnolia Petroleum Co. 7 Seeligson Unit 4. On drill-stem test at 5,564-72 ft., using ¼-in. chokes, it flowed oil in 30 minutes and recovered 900 ft. of pipe-line oil. This well is located in R. P. Haldeman Subdivision of Seeligson Ranch.

Pan American Production Co. and Jack Little, Trustee, 1 Loruth Smith Rivers, wildcat in western Nueces County, approximately 1 mile west of Agua Dulce townsite, tested gas in perforations at 5,533-39 ft., and has reperforated again at 6,002-04 ft. Total depth is 6,316 ft. with 5½-in. casing at 6,031 ft.

The Texas Co. 6 Yturria Land & Livestock Co., deep wildcat test about 8 miles northeast of Raymondville in Willacy County, attempted to blow out while running electrical log to total depth of 16,006 ft. Operators are increasing mud weight and preparing to rerun electrical log.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Starr County: New oil pay, Kelsey-Deep (South) field—Phillips Pet. Co. 1 "Eloy" (Francisco E. Perez et al), in Santa Cruz Grant, dual completion, top pay 5,388 ft., TD 6,100 ft., perf. 5,400-12 ft. (new pay), IP: 218 bbl. oil per day through 5/32-in. choke and ¼-in. choke, gas-oil ratio 910, 850 lb. working pressure, no water. Top pay 5,978 ft., perf. 5,988-6,000 ft., IP: 160 bbl. oil per day through 5/32-in. choke, gas-oil ratio 850, TP 800 lb., csg. sealed, gravity 45°, no water.

Webb County: New oil pool—Dulaney Oil Co. 22 Puig et al, Block 55, Albergas Grant, 10 mi. S of Mirando City, top pay 1,790 ft., TD 1,823 ft., perf. 1,790-1,800 ft., IP: 57 bbl. oil per day on

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SOUTHWEST TEXAS WILDCAT FAILURES

Duval County: Texon Royalty Co. 2 Servando Benavides Hrs., in El Mesquite Grant, 7 mi. NW of Hebbronville, dry, TD 4,507 ft.

Edwards County: Ray E. Pool 1 Joe Peterson, M&ERR Sur., 20 mi. N of Rock Springs, dry, TD 4,851 ft.

Jim Wells County: DeLange & Rowe 1 Sengelmann & Wolters, in Casa Blanca Grant, 4 mi. NE of Orange Grove, dry, TD 5,264 ft.

Starr County: V. F. Neuhaus 1 P. Canales in La Sacatosa Grant, 2½ mi. SW of Sacatosa gas field, dry, TD 1,739 ft.

Travis County: Walker & Wagner 1 T. J. Ledel, in T. McLane Sur., 2 mi. E of Manor, top Georgetown lime 1,285 ft., no shows, dry, TD 1,286 ft.

Webb County: Hickok & Reynolds 1 Amado Perez et al, in J. Poitevent Sur. 459, 10 mi. NE of Bruni, dry, TD 2,631 ft.

Zapata County: Herman Brown 1 Medardo Pena, in Porcion 33, M. Trevno Grant, 1½ mi. SE of Zapata, dry, TD 5,088 ft.

TEXAS GULF COAST

Vidor Field Discovery Is Waiting on Tanks

HOUSTON.—A new shallow-sand discovery in North Vidor field of Orange County, Gulf Oil Corp. 1 Miller-Vidor Land Co. et al, in the J. M. Swisher Survey 1, Abstract 318, is waiting on tanks to gage. Drilled to a total depth of 8,010 ft., with 5½-in. casing cemented at 6,992 ft., well cleaned flowing high-gravity oil and gas through perforations at 6,932-34 ft. Shut-in pressure is 2,600 lb. on tubing.

Mac Drilling Co. 1 Cynthia Payne, wildcat discovery 4 miles south of Evergreen townsite on a Stanolind farmout lease in Vital Flores Survey, San Jacinto County, is perforating again at 6,686-98 ft., the same level as previous tests. A squeeze job was made to shut off salt water.

Progress Petroleum Corp. 1 O. L. Rash et al, test off the southeast flank of production on Manvel dome in Brazoria County, has run tubing and is cleaning into pits for completion. Total depth is 5,640 ft., with perforations at 5,590-94 ft. where a drill-stem test flowed pipe-line oil. This well is located on the Thomas Spraggins Survey, Abstract 366, in Lot 23.

Gulf 29 E. W. Boyt, deep test in Hankamer field of Liberty County, in Amos Allen Survey, Abstract 562, is at total depth of 7,347 ft. The 5½-in. pipe is on bottom and is perforated at 7,010-22 ft. for a test of a new deep horizon.

W. E. Kinnear 1 E. Dittmer, wildcat in Karnes County, about 3 miles southeast of Runge and 1½ miles east-northeast of Runge field, is testing for completion as gas-condensate well at new total depth of 8,180 ft. This test is in Brooks & Burleson Survey 1, Abstract 344.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: Fidelity Oil & Roy. and Magnolia Pet. Co. 2 Hebert, Tr., et al, Donegan Sur., Abst. 566, Sec. 173, approx. 1 mi. SE of Seabreeze production, dry, TD 10,517 ft.

Josey-Bruton 1 Julia H. Casey, Solomon Barrow Sur., Abst. 3, approx. 1 mi. S of east side production at South Cotton Lake, dry, TD 6,908 ft.

DeWitt County: Atlantic Ref. Co. 1 Walter Schaefer, in Thos. H. Bell Sur., Abst. 75, 2½ mi. NW of Mission Valley, dry, TD 8,768 ft.

Jackson County: Hinkle Drilling Co. 1 "L" Ranch, in D. A. Hoffman Sur., Abst. 33, West Ranch area, dry, TD 6,529 ft.

Stewart Pet. Co. et al 1 R. E. Beamon, in Sec. 5, of C. W. Hahl Subd. of D. H. Burn Ranch in J. J. Linn Sur., 5 mi. NW of Vanderbilt, dry, TD 5,130 ft.

Live Oak County: Heyser & Heard 1 A. B. Foster et al, in Refugio County School Land Sur. 8, 7½ mi. SE of Oakville, dry, TD 4,083 ft.

Tyler County: Atlantic Ref. Co. 1 W. E. Thurman, in J. Murphy Sur., in South Hyatt area, dry, TD 10,500 ft.

MISSISSIPPI

Gulf's 1 Major Still Coring and Testing

JACKSON.—Gulf Refining Co. 1 Major, 29-6n-11w, Jones County, continued coring and testing. A drill-stem test at 11,223-228 ft. failed when the tool plugged and the packer was lost. It was then drilled out to 11,233 ft. and another test made with packer set at 11,224 ft., and using a 2,000-ft. water cushion. Open 15 minutes, it produced a slight blow at the surface, and recovery was water cushion plus 94 ft. of drilling mud. Bottom-hole flowing pressure was 1,300 lb. Operators then cored from 11,233 ft. to the last reported total depth of 11,275 ft., recovering 14 ft. of sand with no show and 6 ft. of dark sand, with no shows.

In Marion County, Humble Oil & Refining Co. 1 Tullos, 12-1n-18w, was drilling in shale below 9,843 ft. Sand with no shows was cored at 9,195-9,215 ft. ,and a drill-stem test, with packer set at 9,203 ft., recovered water cushion, 90 ft. of mud, and 5,545 ft. of salt water, in 1½ hours. Humble's 1 Henderson, 32-5n-8w, Greene County, was drilling below 7,232 ft. in shale and limestone. Cores at 6,945-7,070 ft. recovered sand and shale, with no shows.

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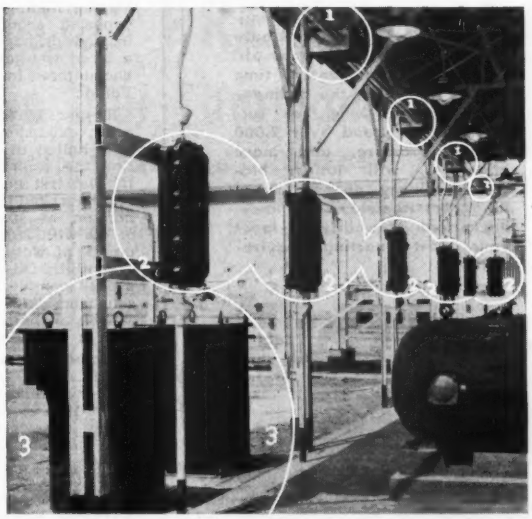

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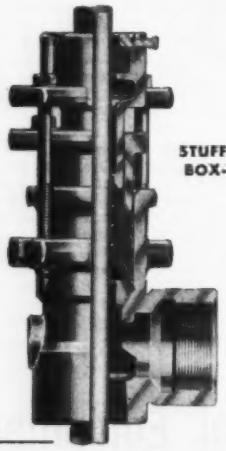

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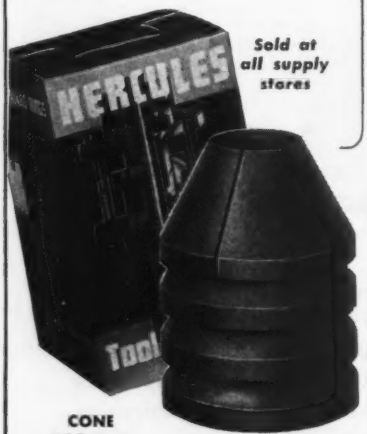

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Walker County, Alabama, Glen D. Rose 1 First National Bank of Birmingham, W½ NW SE 30-12s-7w, last reported total depth at 3,220 ft., has perforated casing at 1,240-45 ft., 1,640-45 ft., and 1,785-90 ft. and is to acidize before testing.

In Winston County, 13 miles northwest of Jasper, the same operators' 3 First National Bank of Birmingham, SW SE 7-12s-8w, total depth 2,005 ft., was perforated at 1,384-89 ft., and 1,442-47 ft. These intervals are to be treated.

ALABAMA WILDCAT FAILURES

Morgan County: D. I. McNabb and C. P. Mayhall 1 Bramlett, NW NW SE 7-8s-4w, dry, TD 2,115 ft., no tops reported.

CANADIAN FIELDS

Results Expected Soon on Shell's Deep Test

CHATHAM.—Definite results are expected within a couple of weeks from the important Shell 5-7-1 deep test in the Jumping Pound area of the southern Alberta foothills, west of Calgary. Located south and east of the discovery well, which got wet gas and light oil in the Madison limestone at 9,947 ft., Shell 5-7-1 is in lower Blairmore formation below 9,521 ft. and logging high, with the production horizon expected around 9,800 ft. The well was located primarily in the hope of securing a large wet-gas production similar to that encountered in the Madison lime in Turner Valley.

Turner Valley.—In the Turner Valley north extension, Royalite 86, LSD 12, 3-21-3w5, halted drilling at 10,145 ft. after getting the second Madison contact at 10,004 ft. The test got the first Madison at 8,951 ft., later faulting. A 21-hour test of the horizon at 10,024-80 ft. showed 1,000 ft. of oil with 250 ft. of salt water and 30,000 cu. ft. of wet gas. Tests are continuing.

Foothills Oil & Gas 11, LSD 11, 4-21-3w5, a 1942 completion deepened in the Madison from 7,422 to 8,546 ft., made around 35 bbl. an hour, after acidizing with 10,000 gal. in upper and lower porous zones.

Production recovery.—In south Turner Valley, Four Star Petroleum 1, LSD 13, 28-18-2w5, completed in the Madison at 7,105 ft. in 1937 as an oil and gas producer, recently experimented with a new production method. The process included the recycling of gas to the producing formation by installation of a compressor system and not merely reduced the gas-oil ratio but increased the actual oil flow.

Lloydminster.—In the Alberta section of the Lloydminster field, Commoil-Lloyd 4, LSD 11, 10-50-1w4, finished at 2,092 ft., has installed pump and is making around 50 bbl. Commoil 3, LSD 6, 10-50-1w4, standing at 1,953 ft., is installing pump. G. L. Globe 1, LSD 4, 2-50-1w4, has spudded.

In the Saskatchewan section of the field, Command-Globe 1, NE LSD 1, 15-47-27w3, is finished at 1,838 ft. after getting lower Cretaceous at 1,652 ft. and Sparky sand contact at 1,811 ft. A test at 1,803-23 ft. showed 2,200,000 cu. ft. of gas through ½-in choke.

West Taber.—In the West Taber field, southern Alberta, California-Standard Taber-Province 63-15-A, LSD 6, 15-9-17w4, finished at 3,229 ft. with a good rise of 22°-gravity oil on drill-stem tests, showed initial production of 110 bbl. in flow tests.

Foremost.—In the Foremost field, southern Alberta, McColl Fontenac-Union 6-4-5-10, LSD 6, 4-5-10w4, was dry at 2,307 ft. McColl-Union 10-B-23-6-10, LSD 10, 23-6-10w4, was dry at 2,407 ft. Additional locations are being made.

Ram River.—In the Ram River-Clearwater area of Central foothills, Ram River 4, LSD 9, 36-34-10w5, plugged back from 1,460 to 1,440 ft. and has been given four shots in the Devonian limestone and will later be acidized prior to testing. Ram River 3, LSD 12, 1-37-11w5, is redrilling below 3,517 ft. with production expected around 4,000 ft. Ram River 2, LSD 8, 2-37-11w5, finished in 1942 at 4,340 ft. with small oil and gas production from the Devonian, is cleaning preparatory to trying a series of small shots of nitroglycerin.

APPALACHIAN FIELD

Greenbrier Test Logs Newburg at 7,458 Ft.

PITTSBURGH.—In Williamsburg district, Greenbrier County, West Virginia, the rotary wildcat of The Texas Co. on G. R. Dean farm logged the Newburg at 7,458 ft. The surface elevation is 2,575 ft. with the Oriskany placed at 6,538-72 ft. which showed some gas in a drill-stem test. Another important wildcat, Godfrey L. Cabot, Inc., 1,226 W. M. Elswick farm, Greenbrier district, Summers County, is drilling at 4,561 ft. with the Big lime logged at 1,115-1,977 ft.

In Union district, Putnam County, Cabot completed a good Oriskany well with a high rock pressure in 1,213 Poca Coal Land Co., which gaged 5,840,000 cu. ft. of gas after shot. The Corniferous lime was topped at 5,078 ft., Oriskany 5,166 ft., gas 5,182-5,201 ft., shot 5,181-5,201 ft., rock pressure 1,825 lb. 44 hours, total depth 5,201 ft.

In Elk district, Kanawha County, United Fuel Gas Co. completed 5,799 Laura F. Ross with a final gage of 3,038,000 cu. ft. of gas with the surface elevation 920 ft., Corniferous lime 5,041 ft., Oriskany 5,166 ft., gas 5,181 ft., shot 5,168-96 ft., rock pressure 610 lb. 16 hours, total depth 5,196 ft. In Poca district, Columbian Carbon Co. completed a good shallow well in 3-A H. H. Parsons which is showing 35 bbl. and 250,000 cu. ft. gas from the Big lime, total depth 1,775 ft.

In Union district, Wood County, Parkersburg Oil & Gas Co. completed 5 R. N. Corbitt Heirs, good for 10 bbl. and 500,000 cu. ft. of gas from the Berea sand.

In Sherman district, Calhoun County, T. J. Arnold is testing 800,000 cu. ft. gas from the salt sand in his test on L. G. Garrett farm and from total depth of 1,830 ft.

New locations in West Virginia totaled 21, and were in Scott and Washington districts, Boone County; Buffalo district, Clay County; Glenville district, Gilmer County; Ripley district, Jackson County; Duval and Harts Creek district, Lincoln County; Harvey and Kermit districts, Mingo County; Grant and Lincoln districts, Wayne County; Baileysville district, Wyoming County.

On Chestnut Ridge in Georges Township, Fayette County, southwest Pennsylvania, Peoples Natural Gas Co. is drilling at 7,322 ft. in the test W. M. Hartman or 148 ft. below the top of the Onondaga chert with no gas showing. This is an offset to the south of the very large gas well on the Smith farm which struck the gas at the top of the chert.

In Summit Township, Erie County, Appalachian Development Co. has made a location for a test on Chester F. Fuhrman farm in the new Oriskany area.

Locations in southwest Pennsylvania totaled 15 and were in Porter Township, Clarion County; Luzerne and Redstone townships, Fayette County; Wayne Township, Greene County; Conemaugh Township, Indiana County; E. Bethlehem, E. Finley, North Strabane, Nottingham, and Somerset townships, Washington County; Allegheny and Bell townships, Westmoreland County.

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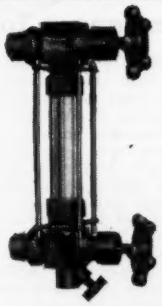

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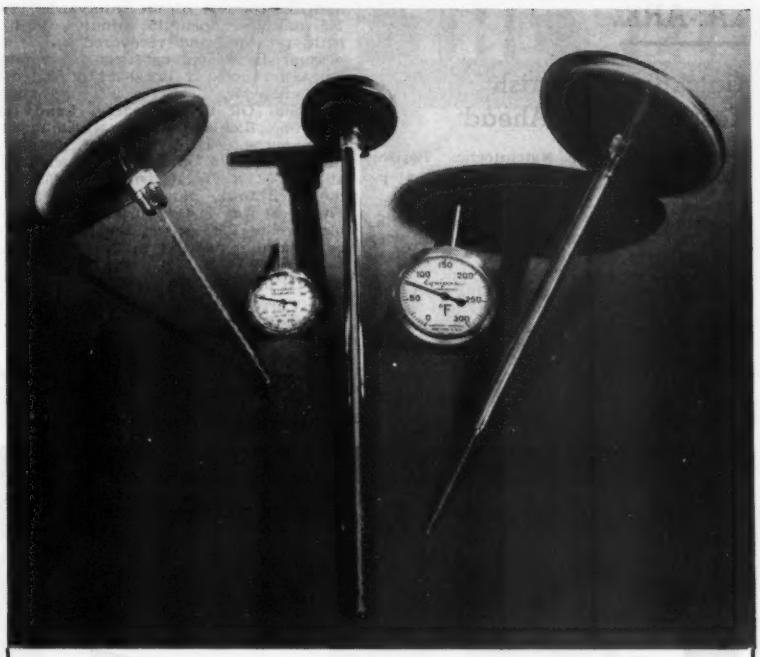

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Natchitoches Parish Test Is Coring Ahead

SHREVEPORT.—In Natchitoches Parish, southeast of the old Ajax area, J. F. Lent et al 1 E. L. Whatley, 20-10n-10w, recovered 60 ft. of oil-cut mud on a drill-stem test at 3,253-85 ft. Total depth was 3,340 ft., with operators coring ahead. Top of the Paluxy was 3,271 ft., by cores. Test was reported to be running high on the Ajax discovery (1941), which had some production in the Paluxy around 3,500 ft.

In Bienville Parish, Lion Chemical Corp. continued testing at its 1 Ozley, 13-17n-6w, with total depth at 10,745 ft. in the Cotton Valley. Perforations at 10,680-94 ft., and a drill-stem test of the interval at 10,680-745 minutes, open 15 minutes, built up little pressure and recovered only 10 ft. of mud slightly cut with gas. A second test on perforations at 10,680-737 ft. failed.

Other wildcat activity included Murphy and Sun Oil Co. 1 Federal Land Bank, 10-17n-9e, Richland Parish, which made an estimated 1,000,000 cu. ft. of gas a day through 3/16-in. choke from perforations at 3,153-58 ft. Total depth is 3,405 ft., in the Glen Rose, plugged back to 3,246 ft. The well was last reported shut in, at a pressure of 1,550 lb. on the tubing. It will be a north extension to the Delhi field.

NORTH LOUISIANA WILDCAT FAILURE

East Carroll Parish: Stanolind Oil & Gas Co. 2 Chicago Mill, SW SE 4-18n-11e, dry, TD 3,000 ft., no tops reported.

Franklin Parish: Gulf Refining Co. 2-A Washington, SW SW SW 11-15n-8e, dry, TD 3,129 ft., chalk 2,079 ft., gas rock 2,088 ft., Austin 2,109 ft., anhydrite 2,790 ft., elev. 79 ft.

Union Parish: Shell Oil Co. 2 Frost, SW SE 14-22n-1w, dry, TD 3,100 ft.

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ROCKY MOUNTAIN

Good Showing Made In Kutz Canyon Test

DENVER.—The Kutz Canyon deep test in San Juan basin, northwestern New Mexico, in Paul B. English-Byrd-Frost, Inc. 1 Government, C NW SW 4-27n-10w, made a more favorable showing this week than at any time since a discovery appeared imminent nearly 3 months ago. The operators have had considerable trouble with the well, which is bottomed at 6,721 ft., approximately 45 ft. in a sand identified as the Dakota. Previously, it had a sand at 6,485 ft. showing some saturation, and another was picked up at 6,573 ft., also showing saturation. One drill-stem test at 6,458-6,694 ft., open 4 hours, recovered 2,700 ft. of oil and gas-cut mud. Heavy drilling mud has stood on the formations for considerable time. When a swabbing test at present depth failed to yield any definite results, the well was shut in for varying intervals and opened up after building up pressure. It cleaned itself several times and made brief flows of 57°-gravity distillate, the best flow being at the rate of approximately 3 bbl. an hour. A changeover to cable tools then was made, and bailing was started. The bailer, run to the bottom, brought up mostly heavy sticky mud for some time, but the quantity of oil in the bailer gradually increased. No test had been made, but it was estimated at 40° gravity. So far there have been no indications of formation water in any of the sands. The 7-in. is at 6,485 ft., and hole is open below that depth. A battery of two 2,500-bbl. tanks and a high-pressure separator have been erected at the well.

Madison lime extension at Cut Bank.—Union Oil Co. 2 Teterud, C SE NE 34-36n-5w, near the center of the gas area of Cut Bank field in Montana, topped the Madison lime at 2,847 ft., and 1 ft. in the sand was making estimated 10,000,000 cu. ft. of gas per day and began spraying oil. It shut down at 2,884 ft. to run casing to bottom. Location is approximately 4 miles east and a little north of 7 McGuiness, nearest lime producer, and approximately 3 miles southeast of the nearest producer in the south group of Madison wells.

Snider Basin wildcat.—Unit agreement for the operation of the Snider Basin area, Sublette County, Wyoming, has been approved, with the California Co. as the operator. Unit includes more than 40,000 acres. Contract for the test, 1 Tierney, C NE NE 15-29n-115w, has been let to Loffland Brothers. The Frontier at 8,000 ft. is the first objective.

Little Buffalo Basin.—Stanolind Oil & Gas Co. 16-E, NE SE SW 1-47n-100w, Little Buffalo Basin, Park County, Wyoming, is a near completion, bottomed at 4,488 ft. in dolomite. It swabbed 562 bbl. of oil in 12 hours through the 2½-in. tubing.

Hudson field test.—Stanolind Oil & Gas Co. 3-M Terry, NW SW SW 19-2s-2e, Fremont County, Wyoming, which had a flow of water estimated at 80,000 bbl. a day in the Tensleep at 1,866 ft., total depth, has not succeeded in shutting off the water. On latest test, open 1½ hours, it made approximately 4,600 bbl. of water and 115 bbl. of oil.

South Fork well.—General Petroleum Corp. 88-24-G, SE SE SE 24-46n-92w, out in the Big Horn basin, Washakie County, Wyoming, through perforations at 10,046-10,125 ft. swabbed 5 bbl. of 29°-gravity crude in 2 hours after acidizing with 5,000 gal. Pumping equipment has been installed for further testing.

Blowout at Mush Creek.—Petroleum Exploration Co. 1 Dodson, SW SE SE 10-44n-

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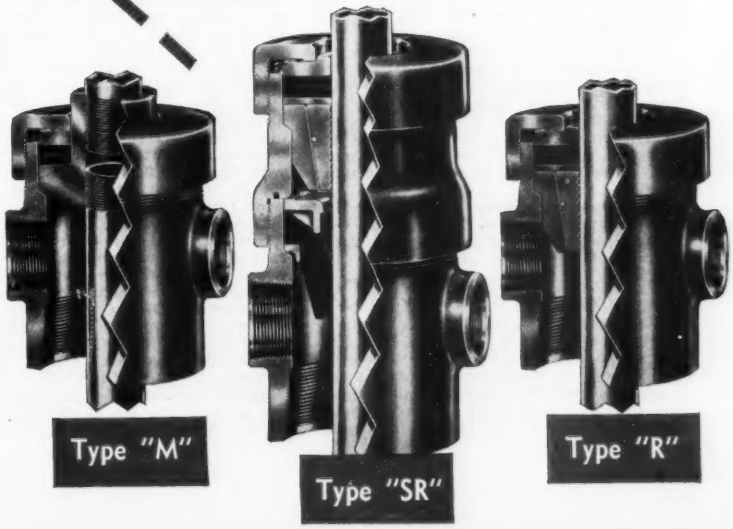

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63w, Mush Creek field, Weston County, Wyoming, ½ mile east of the recent discovery in the Newcastle (Muddy) sand, drilled to 3,938 ft., set the 5½-in. at 3,932 ft. When plug was drilled, the well blew out, making estimated 4,000,000 to 5,000,000 cu. ft. of gas per day. It had good oil saturation at 3,933-38 ft. before casing was run. Well is shut down pending arrangements for completing.

Indian lease sale.—Tide Water Associated Oil Co. was high bidder on a tract of 820 acres south and west, but close in, to the the Brinkerhoff - Sohio extension in the Steamboat Butte field, Fremont County, Wyoming, which is a near completion. The bid was $106,000 for the spread, or $129.27 per acre.

WILDCAT FAILURE IN WYOMING

Continental, Albany County: Dyer & Rice 3 May, SE NE NW 5-15n-77w, TD 3,099 ft., plugged and abd. Water in Sundance at 3,080 ft., Frontier 130 ft., beds thickened below Frontier, may drill another.

WILDCAT FAILURE IN UTAH

Last Chance, Emery County: Mountain Fuel Supply Co. 1 Unit, NW SE SW 18-26s-7e., TD 3,485 ft., lost circulation, abd. rig skidded ½ mile north for 1-A Unit. Shinaramp 1,790, Moenkopi 1,985, Sinbad 2,735 ft.

OHIO, KENTUCKY

Sayre Pool Gets A Good Clinton Gasser

COLUMBUS.—A big well was completed in the Sayre pool by F. R. Beasley on the 1 Martha and John Reed, Sec. 23, Bearfield Township, Perry County. The Clinton was topped at 3,885 ft. and drilled to 3,908 ft. when the well gauged 3,200,000 cu. ft. with a rock pressure of 1,140 psi. The previous Clinton sand wells in the pool have not held up very well and all except one have been drilled down to Medina. The Petroleum Drilling Co.-Industrial Gas 2 Bert Wilson, Sec. 12, Reading Township, came in at 400,000 cu. ft. gas and a show of oil. This well indicates the west edge of the Clayton pool. The Clinton sand was logged at 3,114-58 ft.

Industrial Gas-Foraker 2 Fred Rambo, Sec. 22, York Township, Morgan County, drilled through the Clinton sand and in 18 hours the hole had filled 2,800 ft. with oil. The sand came in at 3,800-34 ft. with pay at 3,822-34 ft.

Atha Realty Co. 1 Forrest Hamilton, Sec. 12, Perry Township, Muskingum County, recently reported as an Oriskany sand gasser, is being deepened to the Clinton.

W. L. Blakely finished drilling through the Clinton on his 2 A. Richert, Lot 10, Brown Township, Knox County, after testing gas in the top of the sand, and the gauge was increased to 900,000 cu. ft.

McGraf et al are drilling a test in the town of Parma in Cuyahoga County. The location is Lot 20, Parma Township, on the Ridgeville Country Club, and is expected to reach the Clinton. The Union Drilling Co. has completed the fishing job on the deep test, 1 Whitacre Co., Brown Township, Carroll County, and is now drilling ahead.

Muskingum and Perry County each has 3 new locations followed by Cuyahoga with 2, and 8 locations scattered. Brush Creek led in wells completed with 6 out of 26.

WESTERN KENTUCKY

OWENSBORO.—Ashland Oil & Refining is drilling below 2,690 ft. in 1 H. T. Latta-Duncan, 14-P-21, Henderson County. A drill-stem test in the McClosky at 2,665-77 ft. recovered gas and 50 ft. gas and oil-cut mud. This test is located about 1½ miles southwest of Burbank Chapel pool and 1½ miles north of the Utley pool. Menard was logged at 2,296 ft., and Renault at 2,500 ft.

Carter Oil Co. has 7-in. set at 1,867 ft. in 1 J. M. Hatchett, 16-O-23, Henderson County, to test the Waltersburg at 1,802-82 ft. after plugging back from 2,818 ft., in the Ste. Genevieve.

WESTERN KENTUCKY WILDCAT FAILURE

Henderson County: J. B. Buckman 1 Ball et al, 2-O-22, dry at 2,325 ft., Lower Menard 1,784 ft., Viola 1,854 ft., Golconda 2,146 ft. Cypress 2,256 ft.

EASTERN KENTUCKY

ASHLAND, Ky.—Completions during the week totaled nearly 2,000,000 cu. ft. in eastern Kentucky field.

Kentucky-West Virginia Gas Co. completed its 5,701 James P. Reynolds, Floyd County, at 2,815 ft., with 822,000 cu. ft. in natural shale.

The company completed its 5,700 S. P. Leslie, Pike County, at 3,173 ft., with 678,000 cu. ft. in shale, after shot.

The same company completed its 5,710 Joseph Stewart, Knott County, at 3,074 ft., with 71,000 cu. ft. in shale and Big lime.

Kentucky-West Virginia Gas Co. completed also its 5,723 W. D. Howard property, Magoffin County, at 1,200 ft., with 203,000 cu. ft. in Maxon, tubing, and 75,000 cu. ft. in Maxon, casing.

INDIANA

EVANSVILLE.—B. M. Heath et al 1 Highman Heirs, SW SE SW 31-5s-13w, Posey County, an old well temporarily abandoned at 3,039 ft., has been cleaned out to 1,980 ft. and pipe has been set at 1,967 ft. to test the Palestine sand logged at 1,966-78 ft. A drill-stem test flowed clean oil. The well is about 1¼ miles southeast of the North Springfield pool.

Sam Malis 1 Fleener, NE SW SW 22-3s-12w, Gibson County, was plugged back to 1,871 ft. from total depth of 2,735 ft. and is testing the Waltersburg at 1,865-70 ft. The hole filled to top and slopped over after 10-qt. shot.

Earnest Zink et al 1 Halter, NE NE SE 7-2n-10w, Knox County, was completed as a 24-bbl. pumper after acidizing the Aux Vases at 1,816-21 ft. with 3,500 gal. Total depth is 1,885 ft.

SOUTH LOUISIANA

Deep Off-Shore Test Is Dry at 12,874 Ft.

NEW ORLEANS.—Magnolia Petroleum Co. 1 State Mineral Lease 673, deep off-shore exploration, in Tract 474, Block 58, 6 miles from Point Au Fer, off shore of Terrebonne Parish, has been completed dry after having been drilled to a total depth of 12,874 ft. and sidetracked hole bottomed at 11,714 ft.

Union Oil Co. of California 1 P. O. Landry, in 29-13s-5e, 3¼ miles west of Avery Island field, Iberia Parish, has indicated a new deep gas and condensate field. Total depth is 11,843 ft. with 7⅝-in. casing cemented to bottom. Pipe was perforated with 60 shots from 11,480-1,500 ft., packer set at 11,447 ft., and swabbed to 500 ft. when well started flowing gas and condensate with 3,600 lb. flowing pressure on the tubing, and had a shut-in pressure of 3,900 lb. A 20 per cent salt-water cut was with the flow. Perforations are being squeezed for another test of the deep sands.

Continental Oil Co. is building roads and moving in equipment for a 12,500-ft. wildcat 1½ miles east of production in Jennings field of Acadia Parish. The 1 W. W. Duson is located in 18-9s-2w.

Another new 12,000-ft. wildcat is Humble Oil & Refining Co. 1 St. Martin Parish School Board, in Little Bayou Long area of St. Martin Parish, 7½ miles northwest of West Lake Verret field production. This test is located in 16-13s-11e.

SOUTH LOUISIANA WILDCAT FAILURE

Terrebonne Parish: Magnolia Pet. Co. 1 State Mineral Lease 673, in Gulf of Mexico, in Tr. 474, Blk. 58, 6 mi. from Point Au Fer, TD 12,874 ft., sidetracked TD 11,714 ft., dry.

OKLAHOMA

Garvin-McClain Wells Looking Good

CITIES SERVICE et al are trying for Viola lime production in 1 Von Wedel "B," C NW NW 22-5n-4w, in the North Lindsay pool, McClain County, after failing to find commercial production in the Bromide sand zone, logged at 11,030 ft. With casing set at 11,005 ft., well was plugged back to 10,920 ft. and a 100-ft. section of Viola was perforated from 10,780 to 10,880 ft. This zone was acidized with 12,000 gal. The well flowed 203 bbl. oil in 28 hours and then settled to 3 bbl. per hour. Operators will reperforate the Viola. If successfully completed, this will be the second Viola well in the East Lindsay pool, the first being the Frank Russell 1 Ed Little, NE NW NE 22-5n-4w. The Von Wedel "B" is a north 40-acre offset to the discovery well of the North Lindsay pool which produces from the Bromide.

In the Northeast Lindsay pool, Pray and Bauman are testing the Chimney Hill section of the Hunton in their 1 Wynn, NE SE SW 26-5n-4w, McClain County. The test was drilled to 10,138 ft. and pipe was set at 10,136 ft. and perforated from 10,008 to 10,040 ft.

The East Lindsay pool appears to be getting a ¾-mile extension to the southeast in Pray & Bauman 1 Hinkle, C NW SW 6-4n-3w, Garvin County. With packer set at 9,911 ft., a drill-stem test was made to total depth of 10,030 ft. in the upper Bromide. Gas showed in 25 minutes and well started flowing in 29 minutes, at estimated rate of 50 to 60 bbl. oil per hour. Gas volume was estimated at 3,000,000 cu. ft. per day.

About ¾ mile southeast of the Hinkle well and about 1¼ miles southeast of the East Lindsay discovery well in NE 1-4n-4w, Pray and Bauman 1 Frankenberg, C NW NE 7-4n-3w, is also a promising prospect on basis of drill-stem test made at 9,795-9,847 ft., which recovered 180 ft. free oil and 2,730 ft. of highly oil and gas-cut mud.

Magnolia Petroleum Co. 1 Parker, C SE NW 18-2n-1w, Garvin County, has pipe set at 6,349 ft., 1 ft. above total depth, to test oil show logged in Hunton at 6,295 to 6,305 ft. This test is 2 miles east of the new Elmore City pool and 3½ miles north of the Katie pool.

One and one-quarter miles north of the Katie pool, Magnolia is running pipe in 1 Walston, C SW NW 29-2n-1w, to test oil shows logged at 6,160-90 ft. in the Bois d'Arc, and at 6,423-50 ft. in the Chimney Hill. Total depth is 6,530 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Dale Sneed 1 Fish, SW SE NE 10-1s-2w, dry, TD 1,158 ft., lime 520 ft.

Cotton County: Bridwell Oil Co. 1 O-Haw-Win-Ne, SE SE NW 17-2s-12w, dry, TD 2,121 ft., lime 812-25 ft., sand 1,100-67 ft.

Needl & Hood Drilling Co. 1 Gregson, NW SW SE 9-3s-13w, dry, TD 1,738 ft., no tops reported.

J. Ben Russell 1 Pay-Au, NE NE NE 24-3s-11w, dry, TD 2,021 ft., no tops reported.

E. P. Griffen 3 Scruggs, C SE NW 21-4s-11w, dry TD 1,238 ft., no tops reported.

Garvin County: McElreath-Suggett 1

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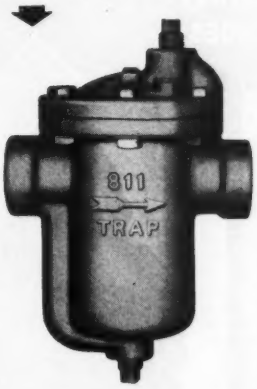

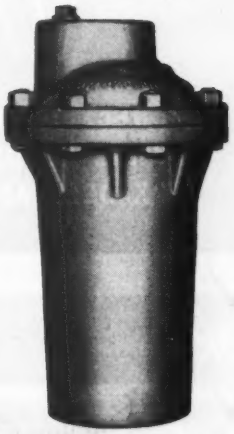

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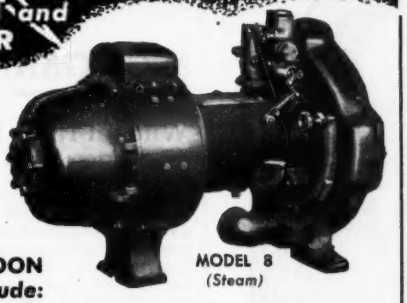

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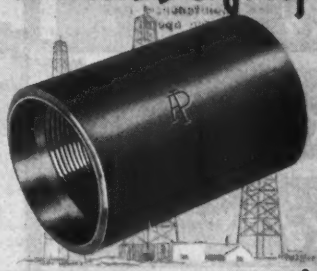

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Kennedy, SE SW NW 14-3n-1w, dry, TD 4,355 ft., sand with stain and odor of oil 4,145-56 ft., base Pennsylvanian-Bromide sand 4,183 ft., McLish 4,338 ft.

Logan County: Stanolind Oil & Gas et al 1 LeGrande, NE NE NW 27-15n-1w, dry, TD 6,042 ft., Pawhuska 2,433 ft., Tonkawa 3,170 ft., Avant 3,830 ft., Perry gas 3,855 ft., Hogshooter 4,363 ft., Layton 4,415 ft., Checkerboard 4,648 ft., Oswego 5,090 ft., Mississippian 5,444 ft., Woodford 5,515 ft., Hunton 5,619 ft., Sylvan 5,631 ft., Viola 5,734 ft., dense 5,578 ft., dolomite 5,840 ft., 1st Wilcox 5,892 ft., 2nd Wilcox 6,006 ft.

Okfuskee County: E. K. Perry & Derby Oil 1 Merrell, NW NW SE 29-11n-9e, dry, TD 3,518 ft., Senora sand 1,920 ft., Allen sand 2,100 ft., Earlsboro 2,405 ft., Bartlesville 2,674 ft., brown lime 2,910 ft., Gilcrease with stain and odor of oil 3,401-20 ft., Union Valley 3,494 ft., Cromwell 3,512 ft.

Oklahoma County: Ptak Petroleum Co. 1 McBirney, NE NE SE 17-14n-1w, dry TD 5,969 ft., Pawhuska 2,450-2,735 ft., Belle City 3,862-3,900 ft., Hogshooter 4,400-4,580 ft., Checkerboard 4,630 ft., Oolitic 5,100-80 ft., Oswego 5,199 ft., Woodford 5,550 ft., Bartlesville 5,325 ft., Mississippian Caney 5,455 ft., Hunton 5,605 ft., Sylvan 5,650 ft., Viola 5,760 ft., dolomite 5,805 ft., 1st Wilcox 5,863-5,910 ft., 2nd Wilcox 5,960 ft.

Pontotoc County: Tuesday Oil 1 Pratt, NW NW NE 6-4n-4e, dry, TD 2,176 ft., sand 928-35 ft., 964-70 ft. and 1,110-45 ft., hard sand with a show of oil 1,145-65 ft., Belle City 1,650 ft., shaly sand 1,667-90 ft., lime 1,690-98 ft., sandy lime 2,030-50 ft.

Pottawatomie County: Cities Service 1 Douglass, C NW SE 31-7n-3e, dry, TD 5,342 ft., Pawhuska 1,860 ft., Belle City 2,900 ft., Hogshooter 3,260 ft., Perry gas 3,110 ft., Layton 3,340 ft., Checkerboard 3,565 ft., Cleveland 3,566 ft., Woodford 4,420 ft., chert 4,475 ft., Sylvan 4,840 ft., Viola 4,940 ft., dense 5,030 ft., dolomite 5,060 ft., sandy dolomite 5,255 ft., 1st Wilcox 5,168 ft., 2nd Wilcox 5,286 ft.

Seminole County: Amos & Workman 1 J. Spears heirs, SE SE NW 19-6n-8e, dry, TD 1,420 ft., hard tight Calvin 945-1,010 ft., Senora sand 1,388 ft.

MICHIGAN

Wildcat Near Reed City Field Eyed by Operators

SAGINAW.—A wildcat operation 8 miles southwest of the once-prolific Reed City oil field is getting attention of Michigan operators. Michigan Devonian Petroleum Co. 1 Corey estate was reported to have flowed 6 bbl. of oil its first day. Acidizing was planned. Located in Section 16 of Barton Township, Newago County, the well was said to have reached oil in Traverse pay at 3,098 ft. The 200-well Reed City field was opened in 1941.

In a week of but three completions, another wildcat was completed as a deep-formation gas producer. It is Panhandle Eastern Pipeline Co. 1 L. N. Brayton in Section 1 of Marion Township, Livingston County. Production was reported as 2,500,000 cu. ft. per day from 3,866 ft.

The other completions were the 200-bbl. J. W. Lang Co. 1 Ochampaugh in Monterey Township of Allegan County and the McClanahan Oil Co.-W. C. Mee 6 Buffalo Land in Clayton Township of Arenac County which was pumping 25 bbl. a day after acid.

Fourteen new locations were announced.

MICHIGAN SUCCESSFUL WILDCAT

Livingston County, Marion Township: Panhandle Eastern Pipeline Co. 1 L. N. Brayton, NE SW NE 1-2n-4e; gas well; 2,500,000 cu. ft.; TD 3,866 ft.

CALIFORNIA

State May Have First Major Strike in 5 Years

LOS ANGELES.—Standard Oil Co. of California has apparently uncovered the long-sought reservoir of light crude in the Oxnard plain, an area that has been the scene of extensive core drilling and exploratory testing during the past 15 years. Standard's Ventura County wildcat, the 2 McGrath, 26-2n-23w, flowed 243 bbl. of 44.0°-gravity crude through a 13/64-in. choke on a 24-hour production test late last week. The oil showed a 0.4 per cent water cut and was accompanied by 1,960,000 cu. ft. of gas. On a later test made through a 10/64-in. choke, production was 161 bbl. per day of 44.3°-gravity crude showing a 0.4 per cent water cut. Gas recovery during the latter test was 1,345,000 cu. ft.

Production at the 2 McGrath is coming from the Repetto formation in the lower Pliocene. Approximately 73 ft. of oil sand is producing with the two productive intervals at 8,428-73 ft. and 8,632-60 ft. The well was originally drilled to a total depth of 11,505 ft. and then plugged back to 8,660 ft. While tools were being pulled after the plugging job, the well blew out and the resulting fire completely destroyed the derrick and equipment.

The new discovery is located about 2½ miles northwest of the city of Oxnard and about the same distance southeast of Montalvo. Nearest light crude production is in the Ventura Avenue field about 8 miles to the north, although heavy, black crude has been produced for the past 12 years along Fifth Avenue, which extends from Oxnard to Conejo approximately 15 miles to the east. In view of the high potential of wet gas at the McGrath well, the theory has been advanced that the heavy oil along Fifth Avenue may be a black oil belt encircling a heavy gas cap. At any rate, the early results indicate that the new area may be the first major discovery of the past 5 years. Standard has staked location for a confirmation test in Section 30-2n-22w. The new test will be known as the 65-3 McGrath and is approximately 2,520 ft. southeast of the 2 McGrath.

British-American Oil Producing Co. has announced a production gage for its second producer in the Alondra Area of Los Angeles County. The well, 3 Bodger, 22-3s-14w, is reported to be flowing at the rate of 500 bbl. of oil daily through a 13/64-in. choke from a total depth of 9,145 ft.

Seaboard Oil Co.'s discovery well in the Bacon Hills area of Kern County, the 3-21 Seaboard-Bandini, 21-28s-20e, started making all water last week and has been killed. Since the well flowed clean oil for a short period after completion, operators are of the opinion that the water is coming from above the oil zone. All perforations to 7,816 ft. have been plugged off, and the well is now standing squeezed through 4 holes at 7,780 ft. It will be re-tested for shut-off above the oil zone at a later date. Location has not been staked for a follow-up well, and definite site for the next well will await the next production test.

R. E. Havenstrite last week announced confirmation of reports that his deep test in the Del Valle field, the 15 Lincoln, 16-4n-17w, has penetrated a new deep sand below the Bering zone. A thick section of oil sand is said to have been logged with the top at 10,140 ft. The well is drilling ahead at 10,455 ft. at present.

New locations jumped to 50 during the past week, an increase of 9 over the previous week. The Lompoc field, with 6 of the new tests, placed first in number of new wells projected, while Wilmington, Cymric and Lost Hills followed closely with 4 each.

CALIFORNIA SUCCESSFUL WILDCATS

Fresno County, Raisin City Area: Superior Oil Co. 35-32 Keisson, 32-15s-17e, flowed 195 bbl. per day, gravity 31.3°, 0.1 cut, 11/64-in. choke, top Domengine 7,031 ft., top Paleocene 7,050 ft., TD 7,076 ft., elev. 191 ft.

Kern County, Elk Hills Area: Standard Oil Co. 24-34 U. O. N. P. R., 34-30s-23e, elev. 1,324 ft., flowed 172 bbl. in 18 hr. from upper Wilhelm, 11.0 cut, 41.0° gravity, 8/64-in. choke, TD 3,375 ft.

Orange County, West Newport Area: Amerada Petroleum Corp., 73-7 Anaheim-Sugar, 7-6s-10w, pumped 55 bbl. in 4 hr., elev. 18 ft., TD 5,500 ft.

Ventura County, West Mountain Area: Los Nietos Co. et al 3 C. & H., 23-3n-21w, flowed 200 bbl. per day through 18/64-in. choke, gravity 25.0°, 15.0 cut, TD 5,181 ft.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, El Segundo Area: Standard Oil Co. 3 Six Companies Fee, dry, elev. 90 ft., Schist-Conglomerate 7,136 ft., TD 7,274 ft.

San Luis Obispo County, San Miguel Area: E. B. Hall & Co. 36-2 Mahoney, 2-25s-12e, dry in shale, elev. 1,025 ft., TD 3,405 ft.

Ventura County, West Mountain Area: Richfield Oil Corp. 1 Saticoy, 22-3n-21w, dry, elev. 275 ft., TD 3,406 ft.

ILLINOIS

Richland County May Get New Pool Opener

MATTOON.—One mile northeast of the Parkersburg Consolidated pool, Harry Evans 1 Provine, W½ NE NW 3-2n-14w, Richland County, is testing saturated Mc-Closky lime, logged at 3,118-28 ft. A 1-hour drill-stem test recovered gas in 7 minutes, 300 ft. oil and 200 ft. salt water. The well was drilled to 3,135 ft. and pipe was set at 3 ft. above the McClosky at 3,115 ft. Glen Dean was logged at 2,574 ft., Barlow at 2,742 ft., and Ste. Genevieve at 3.092 ft.

George Wrather is drilling below 2,033 ft. in 1 Townsend, NW SE SE 30-2n-11w, Lawrence County, about 1 mile west of the St. Francisville pool. Glen Dean was logged at 1,594 ft., Golconda at 1,656 ft., Barlow at 1,741 ft. and Renault at 1,948 ft.

C. G. Davis has set surface pipe on 1 Clements, SE NW NW 28-17n-3e, Macon County, a rank wildcat 10 miles northeast of Decatur.

ILLINOIS WILDCAT FAILURES

Coles County: John Carlson 1 Johns SE NW SW 32-12n-10e, dry at 1,200 ft., no log.

Edwards County: Ernest Eslick 1 Mavis, NW NW NE 22-1n-10e, dry at 3,306 ft., Tar Springs 2,577 ft., Glen Dean 2,660 ft., Aux Vases 3,160 ft., Ste. Genevieve 3,206 ft., McClosky 3,252 ft.

Effingham County: J. J. Lynn 1 Miller NW NE SW 35-6n-6e, dry at 2,858 ft., Menard 2,082 ft., Golconda 2,360 ft., Cypress 2,471 ft., Ste. Genevieve 2,736 ft., Mc-Closky 2,840 ft.

Jefferson County: K. M. Boyer et al 1 Page, SE SE NE 34-4s-4e, dry at 3,407 ft., Menard 2,416 ft., Glen Dean 2,638 ft., Barlow 2,868 ft., Aux Vases 3,169 ft., Rosiclare 3,252 ft.

Fast Play Northwest of Drinkard Extension Well

HOBBS.—Barnsdall Oil Co. has staked an outpost location to Permian production on the northwest flank of the Drinkard field of Lea County. It will be the 1 Edna Elliott Federal NW NW 20-21s-37e and will test to 6,700 ft. Location is 1 mile north of the company's 2 Linan, farthest northwest producer at Drinkard and the same distance west of a recently completed 1-mile north extension to the field.

This extension was Mid-Continent Petroleum Corp. 1-15 State in 16-21s-37e which was completed for 432 bbl. of oil daily through ¾-in. choke from perforations at 6,560-6,630 ft. Mid-Continent's extension has been offset on three sides, Continental Oil Co. to the northwest, Amerada Petroleum Corp. on the north, and Tide Water Associated Oil Co. due west. All are projected to 6,700 ft.

KANSAS

Rush County Gets New Pool Northeast of Ryan Area

TWO miles northeast of the Ryan pool, Solar Oil Corp. 1 Tammen, SW SW SW 24-19s-16w, Rush County, swabbed and flowed 25 bbl. oil in 24 hours, and then swabbed at the rate of 5 bbl. oil per hour, after deepening from 3,697 ft. to 3,700 ft. Casing was set 2 ft. in the Arbuckle, which was topped at 3,659 ft. When plug was drilled out to 3,697 ft., the well had a show of oil and flowed 500,000 cu. ft. of gas. Operators are preparing to acidize.

Darby & Bothwell, Inc., 1 Wetzel, SW SW NW 1-16s-20w, Rush County, swabbed 63 bbl. oil and no water in 2½ hours and swabbed 10 bbl. oil per hour for 5 hours, 50 ft. off bottom. When cement was drilled out to the original total depth of 3,690 ft., 12 ft. below the casing, the hole filled 2,000 ft. with oil from the Sooy conglomerate. Nearest production is in the Penny-Wann pool, 3 miles to the north which also produces from the Sooy.

J. M. Huber Corp. 1 O'Conner, NW NW 16-24s-15w, Stafford County, 2 miles southwest of the Maeksville pool, is drilling below 4,020 ft., after a drill-stem test in the Lansing at 3,775-89 ft., recovered 20 ft. of oil-cut mud. Top of the Lansing is 3,654 ft., Viola is 3,996 ft. Small oil shows were logged in the Lansing at 3,819-27 ft., and 3,851-56 ft.

There are 4 wildcat operations in Kingman County, located east and southeast of the Cunningham pool, which appear to be exploring a northeast by southwest trend through the recently discovered Pat Creek pool and parallel to the Cunningham and Chitwood pools.

Gulf Oil Corp. 1 Calista, NW NE NE 35-27s-9w, is spudded. This test is about 10 miles east of the Cunningham pool. Marshall & Wakefield 1 Albritten, NE NE NE 35-28s-10w, elevation 1,764 ft., had Lansing at 3,686 ft., Viola at 4,502 ft., and is drilling below 4,532 ft. This test is about 3 miles southwest of Pat Creek pool and 6 miles southeast of Cunningham pool. Phil-Han and Gulf Oil Corp. 1 Albritten, SW SW SW 6-29s-10w, elevation 1,793 ft., topped Lansing at 3,749 ft., Mississippi at 4,291 ft., and is drilling below 4,510 ft. This test is about 5 miles southeast of the Cunningham pool. Globe Oil Corp. et al have rig up for 1 Cirkel, NW NE 30-29s-10w, which is located about 9 miles southeast of the Cunningham and Chitwood pools.

KANSAS SUCCESSFUL WILDCAT

Lyon County: Murphy et al 1 fee, NW NW NE 32-21s-11e, pumped 35 bbl. of oil per day from sand at 1,930-42 ft., TD 1,942 ft., no tops reported.

KANSAS WILDCAT FAILURES

Cowley County: Frank McMillim 1 Childers estate, SE SW NE 36-34s-4e dry, TD 3,316 ft., Lansing 2,030 ft., Kansas City 2,484 ft., base Oswego 3,031 ft., Mississippian 3,306 ft.

Ellis County: Darby & Bothwell 1 Truan, NW NW NW 27-12s-18w, dry, TD 3,785 ft., anhydrite 1,400 ft., Topeka 3,103 ft., Heebner 3,319 ft., Lansing 3,408 ft., basal Kansas City 3,596 ft., con-

SUMMARY OF MARCH COMPLETIONS

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000 ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	78	39	102	0	[1]39	0	78	0	0	0	113,049	111
Pennsylvania	204	103	218	13	[2]88	0	185	19	0	0	320,544	162
West Virginia	59	1	10	46	[3]12	2	25	23	9	0	206,598	180
Ohio	97	27	382	42	28	17	21	59	0	0	275,050	219
Indiana	46	22	1,603	4	20	5	37	4	0	0	84,506	72
Kentucky	54	23	1,855	9	22	10	33	10	0	1	91,180	67
Illinois	184	109	8,965	0	75	7	52	125	0	0	481,769	162
Michigan	37	8	1,381	2	27	4	23	9	1	0	76,270	97
Kansas	194	84	34,665	41	[3]69	1	20	171	2	0	610,256	284
Neb., Mo., Iowa	1	0	0	0	1	1	0	0	0	0	250	13
Oklahoma	341	191	21,038	24	126	13	134	155	37	2	997,538	499
Texas	707	447	78,986	54	206	34	168	265	223	17	3,305,276	975
North	147	86	8,008	1	60	14	70	45	18	0	423,722	202
West Central	52	27	2,269	2	23	3	20	28	1	0	151,009	28
West	135	117	43,747	2	16	0	31	63	34	7	629,913	154
Panhandle	39	13	1,664	25	1	0	3	36	0	0	123,435	141
Eastern	29	14	2,779	6	9	0	2	8	19	0	169,955	95
Gulf Coast	159	[4]106	12,297	10	43	0	3	24	124	8	1,026,662	193
Southwest	146	[5]84	8,222	8	54	17	39	61	27	2	780,580	162
Louisiana	94	56	9,614	8	30	3	15	25	33	18	628,999	168
Northern	40	[6]22	1,804	3	15	3	11	16	8	2	146,028	52
Southern	54	[7]34	7,810	5	15	0	4	9	25	16	482,971	116
Arkansas	18	8	552	[8]1	9	0	2	10	6	0	80,886	31
Mississippi	26	[8]15	5,024	5	6	0	4	2	13	7	173,263	101
Ala., Ga., Fla.	3	1	50	0	2	0	0	2	0	1	22,583	16
Montana	12	3	586	5	4	3	6	2	1	0	25,036	38
Wyoming	21	14	2,578	1	6	1	2	12	5	1	89,745	71
Colorado-Utah	18	13	3,594	0	5	0	0	2	16	0	112,542	65
New Mexico	46	35	14,672	7	4	1	5	21	18	1	202,643	102
California	203	159	31,103	5	39	5	49	87	52	10	862,643	281
Total March	2,443	1,358	216,978	267	818	107	859	1,003	416	58	8,760,626	3,714
Total February	2,199	1,183	205,837	273	743	83	779	908	385	44	7,919,726	3,620

Service wells: (1) 39, (2) 82, (3) 1. Distillate wells: (4) 13, (5) 6, (6) 1, (7) 4, (8) 2.

glomerate 3,711 ft., Simpson 3,758 ft., Arbuckle 3,767 ft.

Rooks County: Phil-Han & Bird Boering 1 Veverka, SE SE SE 7-8s-18w, dry, TD 3,413 ft., Heebner 3,095 ft., Lansing-Kansas City 3,116 ft., Arbuckle 3,407 ft.

Sedgwick County: Texas Oil Co. 1 Devine, NE NE SE 11-28s-2e, dry, TD 3,356 ft., Topeka 1,488 ft., Heebner 1,870 ft., Lansing 2,113 ft., Kansas City 2,454 ft., Mississippian 2,931 ft., Kinderhook 3,168 ft., Pyritic sand 3,224 ft., Simpson 3,232 ft., Arbuckle 3,301 ft.

Nitrogen to Be Used in Repressuring Operation

ELLINWOOD, Kans.—Use of nitrogen instead of natural gas or liquids for field repressuring operations will be undertaken this summer in Silica field, east of here, by Stanolind Oil & Gas Co.

Stanolind officials said about $100,000 will be spent in the unique project. The manufactured nitrogen will be compressed and fed into the oil-bearing formation on two sides of a large block of wells in the field.

A Stanolind spokesman said nitrogen will be used because it is cheap, easy to obtain, is nonexplosive, and has a desirable reaction with oil.

Geological Field Trip

A 3-day field trip through the western part of the Ouachita Mountain area of southeastern Oklahoma will be held May 8-10 by the Tulsa Geological Society with T. A. Hendricks, U. S. Geological Survey, as leader. Preliminary registrations indicate an attendance of nearly 300.

Production Meeting Is Set for June 25

A meeting of the reactivated Rocky Mountain district, Division of Production, of the American Petroleum Institute, will be held in the Mammoth Hotel, Yellowstone Park, June 25.

The meeting will precede the summer meeting of the Rocky Mountain Oil and Gas Association, to be held in the same place the following two days. The meetings, though completely separate, were arranged together in order to avoid duplication of travel for oil men attending both.

All Standard of California Tankers Will Get Radar

Radar will be installed as standard equipment on all sea-going vessels of Standard Oil Co. of California, company officials announced last week.

The decision followed test use on a tanker launched in October as the first post-war oil vessel built in the United States with radar embodied in its original design.

In all, 13 other ships will be radar equipped during their regular overhaul periods, company officials said.

Houston Geophysicists Meet

Three hundred geophysicists in the Houston area attended the regional meeting of the Society of Exploration Geophysicists at the Rice Hotel in Houston April 19. Twelve papers were presented, three each on surveying methods, instruments, case histories, and interpretation.

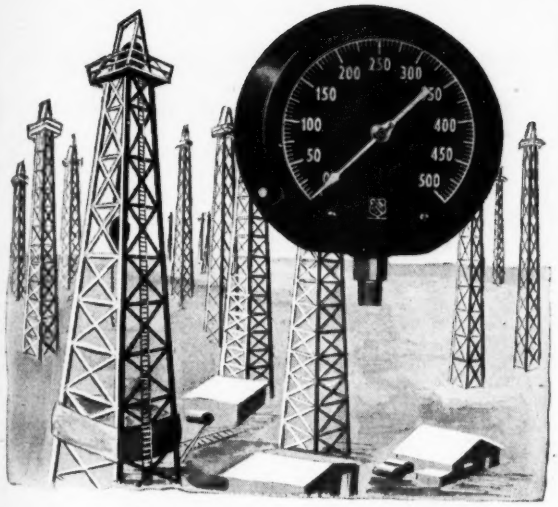
Arkansas Commission Sets Limit on McKamie Gas

EL DORADO, Ark.—The Arkansas Oil and Gas Commission at its recent state-wide hearing issued an order to shut in wells of Arkansas Fuel Oil Co. in Dorcheat-Macedonia field, Columbia County, until such time as the operator complies with rules set by the commission. The company has been asked to show cause for exceeding the maximum overage permitted in producing wells.

The commission changed the allocation for McKamie field in Lafayette County, which may result in an increase in the state's daily total production. The commission limited gas production in the field to 1,250,000 cu. ft. per day and a maximum production of 250 bbl. of oil a day, whichever is reached first.

Truck Movement Drops

Transportation of petroleum products by motor carrier in February showed a drop of 17 per cent below the January figure but even with the decrease remained 28.1 per cent above the figure of February a year ago. During the month petroleum products totaled 7 per cent of the aggregate of 1,704,749 tons of freight handled by motor carriers, according to the American Trucking Association.



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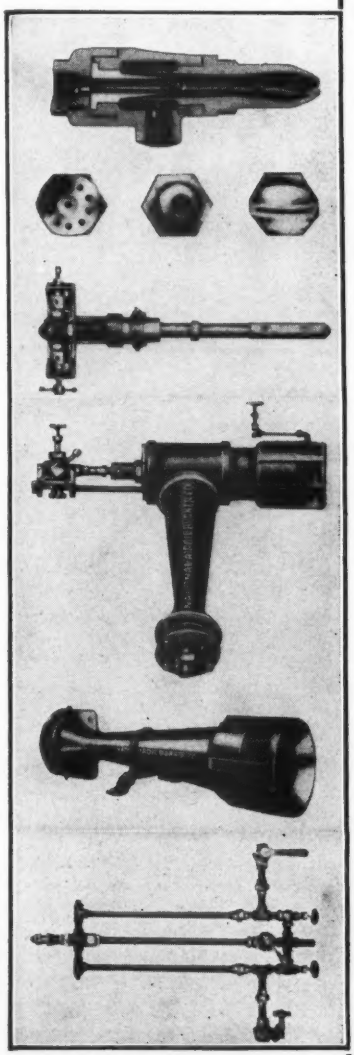

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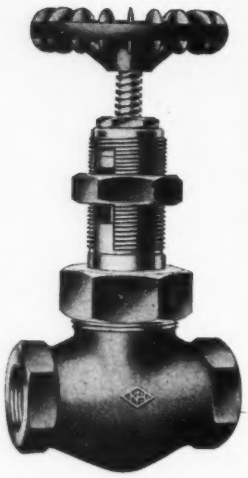

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THE OIL AND GAS JOURNAL
P. O. Box 1260 **Tulsa, Oklahoma**

Among the

Drilling Contractors

Kingery Brothers Drilling Co. was starting the 1 Harner, in NW NE SE 18-5s-1e, Carter County, Oklahoma. Contract is for 2,600 ft.

Shaw Petroleums, of Lloydminster, Alta., is drilling West End 2 in NE LSD 16, 10-50-2w4, in the northwest extension of Lloydminster field.

Universal Drilling Co. will use its own tools to drill its 1 Ross Eller, in NE NW SE 33-2n-9w, Barry County, Michigan.

Commonwealth Drilling Co., of Calgary, has contract for Command-Globe 1, which is being drilled in NE LSD 1, 15-47-27w3 in the Saskatchewan portion of Lloydminster field.

Merrill Drilling Co. has been awarded contract on the George C. Hanners 1 Hanners-Dickerson, in NW NW NE 6-13n-11e, Tuscola County, Michigan.

Harbar Drilling Co. is drilling the J. M. Huber et al 1 Torrance, in SW SW SW 19-21-15, Pawnee County, Kansas. The test is 4 miles south of the newly opened Ash Creek pool in the northeastern part of the county. It is a seismograph prospect on a farmout from Sunray Oil Corp. The contractor has an interest in the test, which is being supported by Magnolia Petroleum Co.

Ajax Drilling Co. will drill the Carter Oil Co. 1 Schiller Unit, in NE NE NE 15-13n-18w, Oceana County, Michigan.

General Petroleums, of Calgary, Alta., has contract for Superior 2, drilling in NE LSD 4, 14-50-2w4, in the west extension of the Lloydminster field.

Rine Drilling Co. has been awarded contract to drill the Lion Oil Co. 1 Bales, in NW NW NW 18-26-13, Pratt County, Kansas. Location is 2½ miles southwest of the Chance pool, and is on a 1,600-acre block.

Ford Henry has the drilling contract on the J. W. Lang Co. 1 Tefil Drozd, in SW SW NE 31-2n-15w, Allegan County, Michigan.

Lowell Drilling Co. has staked location for its 1 Beverly, in NE SE SW 6-14-2, Saline County, Kansas. It is a mile north of Salina pool, and on the northeastern edge of the town of Salina. The company controls a block of approximately 1,000 acres

Day tour crew for Baldridge & King, McAllen, Tex., contractors, who drilled The Texas Co. & Ytarria L. & L., 12 miles north of Raymondville, Willacy County, South Texas' deepest test. The men are: John Ward, derrickman; Fred Ward, fireman; Charles Glidewell and E. J. Skow, helpers, and C. E. Snelling, driller. The test passed a depth of 16,000 ft. on April 11

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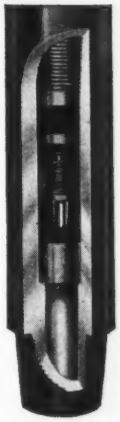

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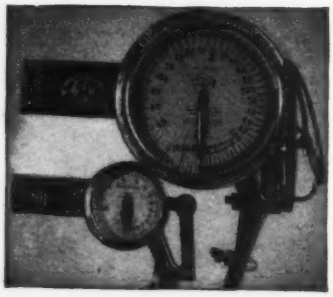


(Above) Super 500,000-lb. capacity, 14" dial. (Below) Packer Special, Capacity 40,000 lbs., 6" dial. 18 other models for every drilling, well servicing, or work-over need.

20 MODELS to choose from

With a LINE SCALE you know the pull on the line, and the weight on the bit in pounds. Repeated tests prove the accuracy and dependability of LINE SCALE readings under all working conditions . . . even in areas of rapid temperature changes.

LINE SCALE CO., Inc.

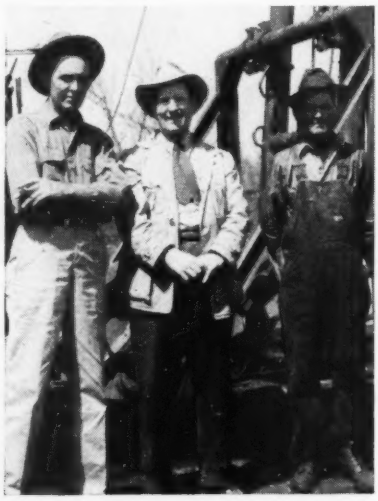
Box 4245 **Oklahoma City** Phone 6-1765

Gulf Coast Representative: Hiram Wheeler Box 8043, Houston 4, Texas — J2-1107

and is receiving support from Westgate-Greenland.

Lupher Drilling Co. is contractor on the Pure Oil Co. A-1 Aisher Dent, in C N½ NW SE 6-15n-6w, Isabella County, Michigan.

Northern Development Co. of Edmonton, Alta., has contracts for Ace 2, NW LSD 3, 7-49-27w3, and Conat 1, NW LSD 5, 19-48-27w3, both in the Saskatchewan section of the Lloydminster field.



J. E. Jackson, driller, Claude W. Morgan, contractor, and N. E. Syrles, driller, of Claude W. Morgan Drilling Co., pose for a picture at the Deep Rock Oil Corp. 3 Owens, in Lincoln County, Oklahoma. The well has just been completed in the Wilcox

E. M. Shields is drilling contractor on the Socony-Vacuum Oil Co., Inc., 2 E. Coon, in NW SW SW 25-9n-11w, Kent County, Michigan.

Drilling Contractors, Ltd., of Calgary recently made a record for rapid drilling in the Leduc area of central Alberta, carrying Imperial-Leduc 4, LSD 16, 15-50-26w4, from 1,310 ft to 3,353 ft. in a single week. Production horizon is slightly below 5,000 ft.

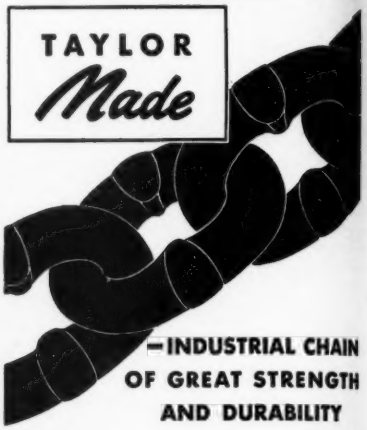
Kingery Brothers Drilling Co. was starting its 2 Nivens-B, in Section 57, MEP&P Survey, Montague County, Texas, in the Bowers field. The test is scheduled to go to 4,100 ft.

Phinney Brothers are contractors on the Clarence Crawford 1 A. Hanna and Village of Sparta, in Section 36, Kent County, Michigan.

Lee Drilling Co.'s president Fred M. McConnell, and H. C. Thompson, chief pilot of the firm, flew from Midland, Tex., to the Carter Oil Co. 1 Helvey, in SE NW 25-2n-2w, a wildcat between the Katie and Elmore City, Oklahoma, areas, to join a tour of the Garvin and McClain County fields, headed by Oscar C. Schorp, president of Carter. The well was drilling at 5,718 ft. in shale.

Mallard Drilling Co. will drill three tests in Ellsworth County, Kansas, for Dozier and National Cooperative Association. These are the 7 and 8 Janssen, and the 4 Williams. The

TAYLOR *Made*



—INDUSTRIAL CHAIN OF GREAT STRENGTH AND DURABILITY

● Where the work is heavy, and the demands of service require chain that is safe and durable, there you find Taylor Made Alloy Steel Chain used extensively. For years of experience in meeting the problems of chain buyers in many fields have enabled Taylor to develop a superior chain for every industrial use. You can cut chain costs by specifying "Taylor Made". Write for prices and information.

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DROP FORGED, HEAT TREATED STEEL

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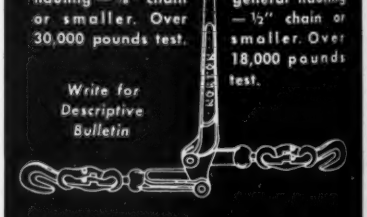
FOR OIL FIELD HAULING

TYPE B: For heavy hauling — ⅜" chain or smaller. Over 30,000 pounds test.

TYPE J: For general hauling — ½" chain or smaller. Over 18,000 pounds test.

Write for Descriptive Bulletin



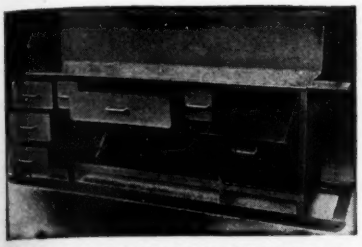
NORTON

EQUIPMENT CO., INC.

P. O. BOX 1185 HOUSTON 1, TEXAS

OWEN

TYPE "A" WORK BENCHES



REDUCE DRILLING EXPENSES

These all-steel, all-welded benches provide a convenient place for all hand tools on the rig. They save drilling dollars by reducing loss and damage of tools and by saving time ordinarily spent in looking for misplaced tools.

Six big drawers and a rag bin provide storage space for all the tools on your rig. Drawers are weatherproof and mounted on rollers for easy operation.

Owen Work Benches are sold through all supply stores and distributed in California by Howard Supply Co. Order one for each rig you operate . . . **they're available for immediate delivery.**

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NO-SMOKE

STANDCO BRAKE LINING

Stands the gaff and gets the job done without scoring brake rims. See pages 3608-3613, Composite Catalog.

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LOAD BINDERS
Drop-Forged • Malleable Iron • Steel

Drop-Forged • Heat Treated • 2 Sizes
Durbin-Boomer F-1—2 swivels, ¾, ⅞ or 1" chain
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Malleable Iron • Heat Treated • 5 Sizes
MIDGET No. 1—1 swivel, ½" chain
DELTA No. 1—1 swivel, ⅝ or ¾" chain
DIXIE No. 1—2 swivels, ⅞ or 1" chain
LONE STAR 1—2 swivels, ⅞, 1⅛ or 1¼" chain
LONE STAR 2—2 swivels, 1⅛, 1⅜ or 1⅝" chain

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4611 Olive Street Road • St. Louis 5, Mo.

contractor also has contract on the Dozier & Phil-Han 2 Dobrinski, in SE NW SE 3-18-8, Rice County, Kansas.

Delta Drilling Co. is contractor on the T. G. Shaw et al 1 Thomas, location for a Paluxy wildcat test to 6,000 ft. in Hopkins County, East Texas. The test is in the John Blocker Survey, 6 miles south of Cumbie.

Buffington & Smith hold drilling contract on the M. B. Chastain and Paul L. Cooper 3-B Stiles, new location for a Paluxy test, in 17-21n-16w, Caddo Parish, North Louisiana.

Gordon Oil Co. has contract to drill the Michigan Consolidated Gas Co. 1 Berry-Smith-MacLeod et al, in C NE 22-14n-8w, Mecosta County, Mich-

Triangle Drilling Co. was moving in material to start its 1 Long et al, outpost to Kickapoo field, DeSoto Parish, Louisiana. Location is in SE SW NW 16-14n-14w. The test will go to 4,200 ft.

Three More Public-Relations Districts Name Officers

Further organization of the oil industry's public-relations program was completed last week in the north-central, New England, and Middle Atlantic areas.

In Chicago, W. J. Arnold, Pure Oil Co., Chicago, was chosen chairman of the Michigan-Indiana-Illinois-Wisconsin district. Named chairman of the state committees were James E. Truesdell, Austin Oil Co., Flint, Mich.; James G. Sinclair, Shell Oil Co., Inc., Indianapolis; Stanton Smith, Smith Oil & Refining Co., Rockford, Ill.; and W. R. Pate, Pate Oil Co., Milwaukee. The group made plans to work with a public-relations field representative who is to open an office in Chicago about May 1.

In Philadelphia, Osman Skinner, vice president of Van Dyne Oil Co., Troy, Pa., was named chairman of the committee for the district comprising Pennsylvania, Maryland, Delaware, West Virginia, and the District of Columbia. R. D. Kizer, Shell Oil Co., Inc., Baltimore, was made vice chairman. Subcommittees are to be named later by Skinner.

In Boston, R. R. Potts, Socony-Vacuum Oil Co., Inc., Cambridge, Mass., became district chairman for the New England area. John Birmingham, president of the Independent Oil Men's Association of New England, was made vice chairman. State chairmen elected were: C. N. Mitchell, Colonial Beacon Oil Co., Hartford, Conn.; Ben Halsell, The Texas Co., Boston; Arthur Putnam, Gulf Oil Corp., Houlton, Me.; Charles Stafford, American Oil Co., Laconia, N. H.; C. A. Sheehan, Socony-Vacuum Oil Co., Inc. Providence, R. I.; and E. J. Collins, Gulf Oil Corp., Burlington, Vt.

WEB WILSON
Tong Dies

"IT'S A WILSON"

WEB WILSON Tong Dies were FIRST with vertical tooth design, bevelled ends and the full 5¾" length. USE ONLY GENUINE WEB WILSON DIES. Interchangeable in all WEB WILSON and WILSON-type tongs and in most other tongs in use in the fields today.

SEE COMPOSITE CATALOG FOR COMPLETE DETAILS

WEB WILSON
Oil Tools
W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

VARCO

UNITIZED ROTARY DRILL PIPE SLIPS

For 2⅜"-6⅝" drill pipe
(1) With patented "Varco" buttons. (2) Uniform load distribution. (3) Maximum grip area. (4) Long enduring life. (5) Light weight. (6) Chrome alloy heat-treated steel. (7) Forged alloy steel handles.

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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 19, 1947

	Total of all wells							Wildcat completions and discoveries									
						Cum.							Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	17	9	0	*8	24,633	395	472	0	0	0	0	0	3	0	0	2	5
Pennsylvania	47	23	5	†19	73,837	922	1,216	0	0	0	0	0	0	0	0	0	0
West Virginia	12	2	10	0	33,757	241	211	0	0	0	0	0	0	0	1	0	1
Ohio	26	5	11	10	71,552	368	325	0	0	0	0	0	0	0	2	16	18
Indiana	16	3	1	12	28,680	163	89	0	0	0	0	0	4	0	0	13	17
Kentucky	9	0	4	5	18,363	138	133	0	0	0	1	1	5	0	0	11	16
Illinois	27	16	0	11	71,829	533	588	0	0	0	4	4	18	0	0	79	97
Michigan	3	2	1	0	8,112	170	193	0	0	1	0	1	2	0	4	58	64
Kansas	50	29	9	12	157,569	755	585	1	0	0	4	5	12	0	7	78	97
Neb., Mo., Iowa	0	0	0	0	0	2	5	0	0	0	0	0	0	0	0	2	2
Oklahoma	81	42	5	‡34	225,940	1,220	713	0	0	0	11	11	26	2	3	221	252
Texas	155	88	9	58	613,388	2,448	2,365	6	0	1	22	29	82	16	24	374	496
North Central (Dist. 7B & 9)	57	28	0	29	142,511	752	805	3	0	0	5	8	34	0	5	129	168
West (Dist. 7C & 8)	30	26	2	2	133,815	575	505	1	0	0	1	2	8	0	2	44	54
Panhandle (Dist. 10)	4	2	2	0	14,623	134	118	0	0	1	0	1	1	0	1	0	2
Eastern (Dist. 5 & 6)	13	2	3	8	62,929	147	223	0	0	0	2	2	1	0	1	34	36
Gulf Coast (Dist. 3)	23	12	2	9	136,500	470	538	0	0	0	7	7	18	11	10	78	117
Southwest (Dist. 1, 2 & 4)	28	18	0	10	123,010	370	176	2	0	0	7	9	20	5	5	89	119
Louisiana	22	15	0	7	156,094	344	389	0	0	0	4	4	12	7	2	47	68
Northern	9	4	0	5	32,460	165	198	0	0	0	3	3	0	0	0	28	28
Southern	13	11	0	2	123,634	179	191	0	0	0	1	1	12	7	2	19	40
Arkansas	4	2	0	2	19,342	73	57	0	0	0	0	0	0	0	0	12	12
Mississippi	6	5	0	1	54,992	101	73	0	0	0	0	0	0	0	1	23	24
Southeastern States	1	0	0	1	2,115	15	13	0	0	0	1	1	0	0	0	13	13
Montana	4	3	0	1	9,428	46	76	0	0	0	0	0	0	0	0	8	8
Wyoming	2	1	0	1	9,080	60	50	0	0	0	1	1	4	0	1	12	17
Colorado-Utah	2	1	0	1	10,112	52	35	0	0	0	1	1	1	0	0	9	10
New Mexico	4	4	0	0	22,980	150	120	0	0	0	0	0	3	0	1	12	16
California	49	43	1	5	209,492	577	551	4	0	0	3	7	14	0	0	87	101
Total United States	537	293	56	188	1,821,295	8,773	8,259	11	0	2	52	65	186	25	46	1,077	1,334
Total previous week	548	300	54	194	2,109,550	8,236	7,764	18	5	6	54	83	175	25	44	1,025	1,269
Total April 20, 1946	495	256	51	188	1,643,459			12	1	1	61	75	145	14	37	934	1,130

Service wells included: *8, †18, ‡2.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.40	....	....	....
19-19.9	1.45	....	....	....
20-20.9	1.49	$1.55	....	$1.42
21-21.9	1.53	1.57	....	1.44
22-22.9	1.57	1.59	....	1.46
23-23.9	1.60	1.61	....	1.48
24-24.9	1.64	1.63	$1.86	1.50
25-25.9	1.68	1.65	1.88	1.52
26-26.9	1.71	1.67	1.90	1.54
27-27.9	1.75	1.69	1.92	1.56
28-28.9	1.79	1.71	1.94	1.58
29-29.9	1.82	1.73	1.96	1.60
30-30.9	1.86	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*For crude from Daboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED APRIL 12

(Thousands of barrels)

District—	Crude runs, daily avg.	Production				Stocks at refineries, bulk terminals, in transit and in pipe lines			
		Gasoline†	Kerosene	Gas & dist. oil	Residual	Gasoline*	Kerosene	Gas & dist. oil	Residual
East Coast	799	1,788	192	1,222	1,685	22,580	4,033	8,954	6,274
Appalachian:									
District 1	87	238	48	84	81	2,682	187	306	234
District 2	66	148	19	68	102	1,050	39	67	100
Ind., Ill., Ky.	732	2,431	317	821	941	22,679	1,129	2,467	1,823
Okla., Kans., Mo.	390	1,370	198	424	461	10,711	333	1,197	897
Inland Texas	231	1,080	118	120	389	4,370	185	301	701
Texas Gulf	1,015	3,275	669	1,381	1,613	14,927	1,440	5,472	5,250
Louisiana Gulf	369	1,069	287	478	432	5,681	678	1,857	1,514
N. La. and Ark.	64	172	46	63	102	1,936	293	406	118
Rocky Mountain:									
New Mexico	11	39	4	10	20	83	16	36	54
Other	122	350	23	148	220	3,049	51	479	639
California	781	2,140	90	680	2,186	16,473	852	10,477	25,352
April 12, 1947	4,667	14,090	2,011	5,499	8,232	106,221	9,236	32,019	42,946
April 5, 1947	4,772	14,374	2,138	5,653	8,206	106,966	9,213	32,358	43,541
April 13, 1946	4,630	13,051	1,910	5,380	8,407	102,118	10,177	31,202	37,767

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 231,546,000 bbl. as of April 12—up 1,145 bbl. One year ago 221,260,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas	$1.95
Kettleman Hills, California*	1.94
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	3.51
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

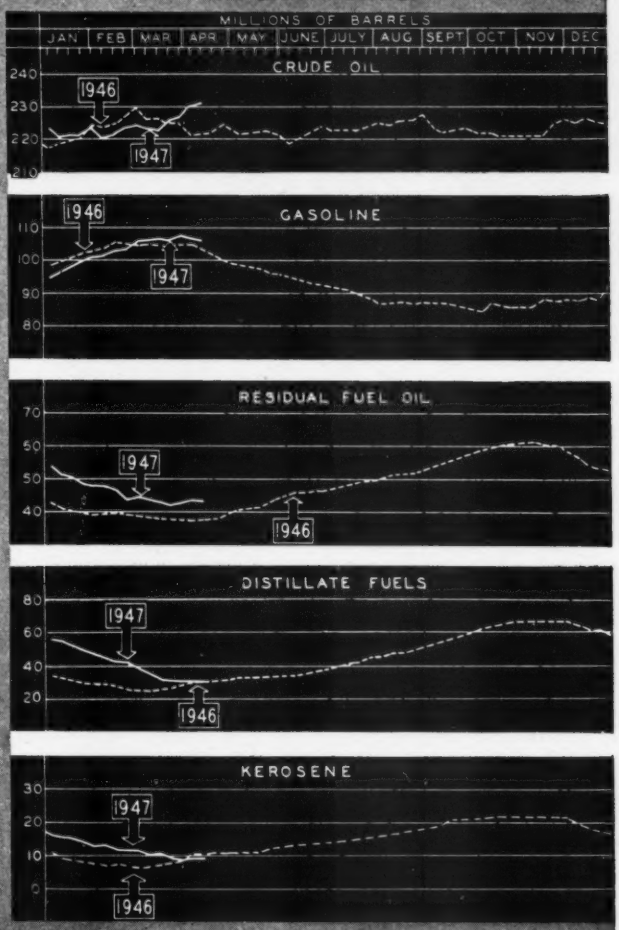
DAILY AVERAGE PRODUCTION FOR WEEK

	Apr. 19 crude oil	B. of M. Apr. demand	Apr. 12 crude oil
Alabama	400	1,200	900
Arkansas	80,850	79,000	80,550
California	907,500	860,000	909,750
Colorado	38,110	38,000	36,750
Eastern	65,000	65,200	63,000
Florida	550	200	575
Illinois	186,300	210,000	186,100
Indiana	18,200	18,000	18,500
Kansas	278,450	275,000	269,800
Kentucky	24,600	29,000	25,400
Louisiana	415,355	410,000	414,655
North Louisiana	102,750	.....	102,050
South Louisiana	312,605	.....	312,605
Michigan	42,140	47,000	43,875
Mississippi	85,540	84,000	87,590
Montana	23,060	24,000	23,190
Nebraska	600	700	600
New Mexico	103,155	102,000	103,155
Oklahoma	376,900	380,000	378,900
Texas	2,150,545	2,120,000	2,150,545
Dist. 1 (Southwest)	20,664	.....	20,664
Dist. 2 (Southwest)	157,957	.....	157,957
Dist. 4 (Southwest)	241,971	.....	241,971
Dist. 3 (Gulf Coast)	483,443	.....	483,443
Dist. 5 (Eastern)	38,147	.....	38,147
Dist. 6 (Eastern)	111,284	.....	111,284
East Texas field	325,571	.....	325,571
Dist. 7C (West)	35,697	.....	35,697
Dist. 8 (West)	480,710	.....	480,710
Dist. 7B (W. Central)	36,768	.....	36,768
Dist. 9 (N. Central)	133,543	.....	133,543
Dist. 10 (Panhandle)	84,790	.....	84,790
Wyoming	112,630	106,000	111,480
Miscellaneous	.....	700	.....
Total United States	*4,909,885	4,850,000	4,905,315
Change from prev. wk., up	4,570		

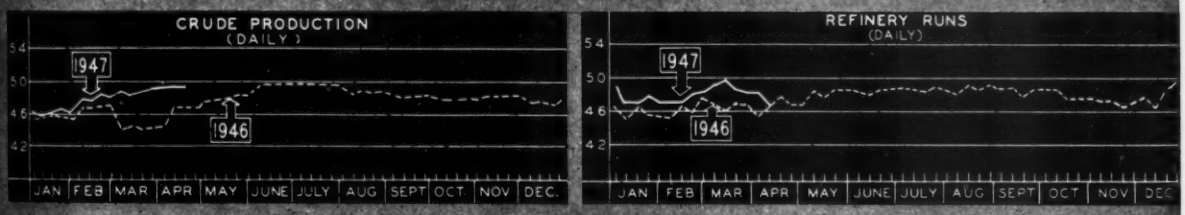
Total production January 1-April 19..... †524,447,470 bbl.
Same period last year (crude plus cond.).. 506,816,685 bbl.

*Not incl. 27,190 bbl. condensate. †Incl. 2,819,070 bbl. condensate.

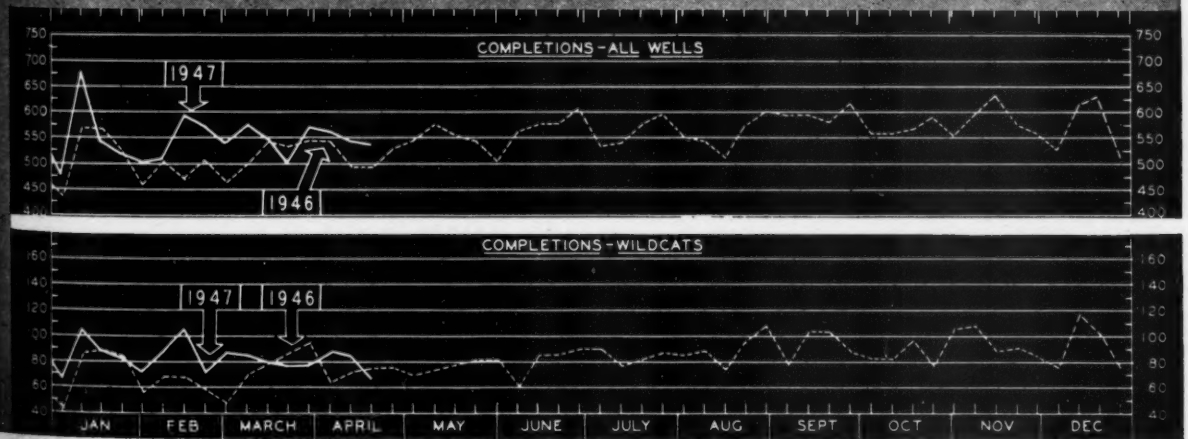
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.



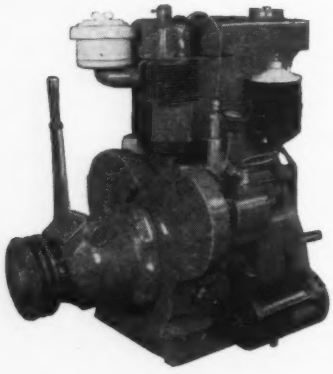
I was looking ahead when I bought a 3½ H.P. AIRCOOLED

Sheppard Diesel

THERE ARE *cheaper engines. But, the rugged little Sheppard will be going strong long after the others would have worn out.*

NO ELECTRICAL IGNITION . . . *no carburetor . . . means a minimum of servicing and lower maintenance costs. Looking ahead over a period of years — that's important.*

I LOST *a plant when a spark ignited a fume-filled room. It won't happen again . . . not with the Sheppard on the job. That protection alone more than justifies its cost.*



The model 14 Aircooled Sheppard is available as a power unit or direct connected to a 2,000 watt generator. See it at your nearest Sheppard Distributor. We will forward his name on request. Also literature with complete specifications available.

R. H. SHEPPARD CO., INC.
22 Middle St., Hanover, Pa.

Sheppard DIESEL

Generating Sets • 2,000 to 36,000 watts
Power Units • 3½ to 56 continuous H. P.

DIESEL'S THE POWER . . .
Sheppard's the Diesel

MARKETS

Continued heavy demand for all petroleum products, including those normally suffering a seasonal lull at this time of the year, characterized the abnormal 1947 market during the past week in the midwestern and Mid-Continent areas.

More cold weather in burning oil areas, which blew snow as far south as scattered points in Texas, together with apprehensions among dealers that shortages might grow more critical with future months, heightened the demand for light burning oils. Some bulk dealers with individual storage capacities in excess of 1,000,000 gal. already were placing orders for burning oils and kerosene in order to assure themselves of adequate supplies for the autumn demand. The current tight situation, combined with the tank car shortage, found some bulk-station operators with empty tanks.

Gasoline Tight

In spite of record production of crude and record refinery runs, many small refineries looked forward to the gasoline season with empty storage tanks. Refiners and marketers took a pessimistic view of the approaching heavy-demand season and forecast periodical shortages of motor fuel by individual companies. Only indication of a possible break in the increasing gasoline demand came from a refiner who said a study had showed consumer demand switching from premium to regular-grade gasoline.

Observers expected the Texas City disaster, with its destruction of oil properties there, to further tighten the products situation, particularly in No. 2 distillate, which is shipped from that point to Mid-Continent and Midwestern areas in considerable quantities. Extent of the effect on the market awaited a more accurate determination of the damage to oil installations.

Although nearly all observers were anticipating an easing up in the shortage of tank cars, little change in the shortage was seen during the week. A barely-perceptible improvement during recent weeks had aided shippers to keep pace with current orders and most were expecting to clear up delayed deliveries in the near future.

In Texas, oil companies were following the lead set by The Texas Co., Magnolia Petroleum Co., and Humble Oil & Refining Co. in reducing tank-wagon prices of motor fuel a half cent a gallon. The reduction followed the action of Gulf Refining Co., which raised the tank-wagon price only a half cent when the other companies hiked the price a full cent a gallon. Tank-car prices remained unchanged.

High Prices to Remain

Predictions of continued high prices for petroleum products were sounded last week by more oil industry leaders. In New York, Eugene Holman, president of Standard Oil Co. (N. J.), said there will be no "immediate reductions" stemming from President Truman's plea that industry slash prices. Competition, however, should hold prices fairly stable at this time, he said, warning that higher prices might cause the industry to lose business to such commodities as coal.

In Pittsburgh, A. J. McIntosh, economist for Socony-Vacuum Oil Co., declared demand in 1947 will exceed that of the peak year of 1945 and said petroleum prices will not decline "because they have advanced only half as much as general commodities, and the basic raw material, crude oil, needs a good price to stimulate finding more of it."

Representative Quotations

Representative spot-market quotations of leading suppliers as of last Monday. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel.

GASOLINE, KEROSENE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8-8.5	10.1-10.4* 9.2- 9.4†	7.75-8
Premium gasoline, 78-80 octane	8.75-9.5	10.2-12	8.5 -9
42-44 w.w. kerosene	6.875-7.25	7.8	6.75-6.875
No. 2 straw fuel oil	6.125-6.625	6.8-6.9	5.5-5.75
No. 6 residual	$1.80-1.95	$2.22	$1.55-1.70

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.375	4.875	5.125
Grade 18-55	6.45	5.85	6.15

LUBRICATING OILS

Mid-Continent

150-160 vis. D bright stock, 0-10 p.p.	29
200 vis. No. 3 neutral, 0-10 p.p.	18-20

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-12.5
750 vis., No. 3-4 neutral	13-15.25
2,000 No. 5-6 neutral	14.5-16.75

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	42
180 vis. 0 p.t. neutral	42

Equipment Men in the News

Parkersburg Celebrates Fiftieth Anniversary

To commemorate 50 years of service to the oil industry, The Parkersburg Rig & Reel Co., Parkersburg, W. Va., has issued a special anniversary issue of the company publication, The Rig & Reel. In this issue a message from the founder, John M. Crawford, to the oil industry is presented, along with reviews of yesteryear in the petroleum industry. A pictorial presentation of the top management and sketches of the various divisions are included.

Davison Chemical Acquires New Plant

Increased synthetic catalyst capacity is reported by Chester F. Hockley, president of The Davison Chemical Corp. Arrangements have been completed with War Assets Administration for purchase of a synthetic-catalyst plant at Cincinnati. Davison is now operating this plant in the manufacture of synthetic fluid catalysts for fluid cracking plants.

Kirkbride Joins Houdry

C. G. Kirkbride, prominent in engineering circles and former professor of chemical engineering at Texas A. & M. College, has joined Houdry Process Corp. as director of the Houdry laboratories. Kirkbride has held positions as assistant director of research for Pan American Refining Co. and as research engineer with Standard Oil Co. (Indiana). The new director of Houdry laboratories is chairman of the program committee for the American Institute of Chemical Engineers and is a director of the A.I.Ch.E.

New Plant for Timken Axle

Walter F. Rockwell, president of Timken-Detroit Axle Co., Detroit, announces that construction has been started on a new Timken Axle brake plant at Ashtabula, Ohio. Located on a 45-acre site on the eastern outskirts of Ashtabula, the new brick-and steel building will, when finished by the year's end, contain 80,000 sq. ft. of floor space for the manufacture of brakes and related parts. All operations in the new plant will be under supervision of Ray L. Morrison, general manager of the Timken Axle Brake Division.

Connors and Williams to Arabia

Guy S. Connors and David R. Williams, vice presidents of Williams Brothers Corp., Tulsa, sailed late in March for England en route to Palestine and Arabia to make a reconnaissance of the Trans-Arabian pipeline route. Their departure followed Connors return from an 18-day trip to South America, during which he visited Venezuela, Colombia, Ecuador, Peru, Bolivia, and Argentina.

Expansion in Green Head Bit

Paul R. Snetcher, president and general manager of Green Head Bit & Supply Co., announces that J. O. Dorroh, Jack DeFee, and M. L. Williamson have bought an interest in the company and will operate the Odessa and Houston stores. Green Head, with headquarters in Oklahoma City, also has a branch store at Goodwill, Okla., and contemplates other branches in the near future. J. O. Dorroh will operate the Houston branch, M. L. Williamson the Odessa branch, and Jack DeFee will be stationed in New Orleans.

Dowell Assigns New Engineer To Artesia

Gordon R. Grigsby has been appointed as sales engineer for Dowell Incorporated and stationed at Artesia, N. M., according to Nathan D. Webb of Midland, West Texas-New Mexico district manager for the concern. Grigsby will work with the Dowell station at Hobbs, N. M., and service the company's customers in the area served by that unit. He has been with the organization since 1944 and has specialized in the use of plastics in its various oil-well applications. Prior to going with Dowell he had experience on the Texas Gulf Coast in drilling and production work.

United Geophysical Personnel In Middle East

C. E. RIDDELL

C. E. Riddell, area supervisor of United Geophysical Co.'s activities in the Middle East area, was recently in the United States on a business trip. He has since returned to the company's base headquarters at Karachi, India. O. K. Fuller, Jr., is heading the company's seismograph crew in India, with base headquarters at Karachi. Other members of the crew who arrived in India the early part of the year are W. H. McGuire, chief computer; J. R. Riddle, observer; Jack Short, junior observer; H. H. Haun, surveyor; Kenneth Deaver, shooter; A. R. Isaacs, and T. J. Price, drillers.

Hammond to Manufacture in Texas

Hammond Iron Works, Warren, Pa., fabricators of petrochemical tanks and vessels, announces the acquisition of complete manufacturing facilities at Port Neches, Tex. This plant, built and operated by Rubber Reserve during the recent war, has complete equipment for the manufacture of A.P.I. storage tanks and chemical-processing vessels.

Norris West Coast Division Manager

JAMES A. NORRIS

Kerotest Manufacturing Co., Pittsburgh, announces the appointment of James A. Norris as West Coast division sales manager and the opening of new division offices at 315 West Ninth Street, Los Angeles. The company formerly occupied offices at 3305 East Slauson Avenue, Los Angeles. Joseph A. Swaton and John H. Mueller will continue as West Coast field representatives.

New Rodpak Executive

Rodpak Manufacturing Co., San Francisco, announces the entry into the firm of G. M. Forslund, in the capacity of vice president. Forslund, who will act as sales manager for this industrial concern, has had many years of experience in the field of mechanical packing. Before joining Rodpak he was associated with the firm of Marden & Hagist, Portland, Ore. Roy Hamilton, one of the founding members of the firm, will continue as president.

Hesler Company Formed

The three Hesler brothers, natives of Kansas City, Mo., have returned to that city from the services to form Hesler Co. Harold P., William W., and Delbert P. Hesler are graduates of University of Michigan and are registered professional engineers in Missouri. Their office at 950 Dierks Building, Kansas City, has been commissioned by Electric Machinery Manufacturing Co., Minneapolis, to sell its line of motors, generators, magnetic drives, and controls.

Raybestos-Manhattan Opens Office in Cleveland

Opening of a consolidated office in Cleveland at 1071 Union Commerce Building is announced by Raybestos-Manhattan, Inc. Other Cleveland divisional officers have also been combined in this office. Divisions of the corporation are represented at this office as follows: Manhattan Rubber Division by T. Robinson; Asbestos Textile & Packing Division by D. E. Gow; and Equipment Sales Division and the United States Asbestos Division by E. E. Juergens. R. F. Tobin is office manager.

Alloy Steel Products Adds Two

Herbert V. Evans, Jr., and H. C. Grieme have joined the sales department of Alloy Steel Products Co., Linden, N. J.

Century Geophysical Corp., Tulsa, has moved all departments into its new laboratory-office building, 1333 North Utica Avenue. An open house for oil and technical men was held April 18 to inaugurate the opening. Officers of the firm are Opie Dimmick, president; M. E. (Bob) Morran, executive vice president; E. J. Handley and C. E. Hendricks, vice presidents

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads except Situations Wanted, 10 cents a word. Minimum charge, $2.00 per insertion.
Situations Wanted ads, 5 cents a word. Minimum charge, $1.00 per insertion.
Centered Line, any ad, 75 cents.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$9.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

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THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

TWO PUMPING UNITS FOR SALE. Very reasonable price. Could be used to pump 3,500 foot wells. 409 Bewley Bldg., Fort Worth, Texas. 2-1620.

SPUDDER—Fort Worth Spudder D located on siding in Tulsa. Travco Equipment Co., 110 Midco Bldg., Tulsa, Oklahoma. Phone 5-2251.

FOR CABLE TOOLS
See
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

WELL DRILLING Machines, Spudders, Core drills, Standards. Complete stock cable tools. Used equipment reconditioned. Some Government surplus. Pressey & Son, Pueblo, Colorado.

FOR SALE: 1—Wichita 66 Spudder, 1—Le-Roi engine, tools from 15½ to 7 inch. Krohler light plant outfit complete. Priced to sell. Phone 589, Walter A. Hale, P. O. Box 3437, Cut Bank, Montana.

FOR SALE: Pumping Units. All types & sizes. New and used. Bridgeports, Jensens, Americans, Atlas, Ideco, with or without Power. Glenn Supply Co., 3600 Sand Springs Road. Phone 3-9607, Tulsa, Okla.

FOR SALE: 6—5,000 bbl. New A.P.I. Bolted steel tanks. 7—10,000 bbl. New A.P.I. bolted steel tanks. Also 1,000 bbl., 500 bbl. new A.P.I. steel tanks. New and used grain tanks. Welded steel tanks. Independent Tank Mfg. Co., Seminole, Oklahoma. Phone 977.

EQUIPMENT FOR SALE

FOR SALE: Six New Kobe, 2½ inch tubing insert, pumps, one Triplex—Bargain for immediate sale. Ben Beckham, Jr., Box 134, Overton, Texas. Phone 3921.

LUMBER FOR SALE: 3x6 and wider 10 to 16 rough Oak $58.00 f.o.b. mill. E. J. Gaiennie, Lumber, Box 1074, Shreveport, Louisiana.

FOR SALE: All kinds of atmospheric coolers, Tulsa, Coynoco and GR. all in first class condition. ENGLE PETROLEUM, INCORPORATED, P. O. Box 72, Mt. Carmel, Illinois.

FOR SALE: One Wilson Super Spudder, powered by completely reconditioned PA-100 motor, complete with mast and 5,000-ft. drilling and sand line. Located at Plainville, Kansas. Phone 1338, Hays, Kansas. Price $7500.00.

FOR SALE: New Star 49 C Heavy Duty Spudder, has drilled two wells only; new 10″ seamless tubular steel "A" combination mast, new D 13,000 skid mounted Caterpillar Diesel drilling engine, new sectional house. Complete tools 18″ down, Big Hole Pipe 15″ down. Star 45 C Heavy Duty Spudder equipped same manner. Box B-683, The Oil and Gas Journal, Tulsa, Oklahoam.

FOR SALE

12—230 H. P. Bessemer and Clark horizontal Engines with new 17″ Power Heads complete with compressors in first-class condition.

ENGLE PETROLEUM, INC.
P. O. Box 72
MT. CARMEL, ILLINOIS

CENTRIFUGAL PUMPS

(Gas Engine Driven)

Aurora Pump — 76 H.P. Industrial Chrysler Engine

4″ Suction & Discharge 480 G.P.M. at 300 Ft. Head Pressure. Completely Assembled; Skid Mounted. Spare parts, tools and accessories with each pump.

$865.00 FOB, Tyler, Tex.

IDEAL FOR
Irrigation, Water Supply, Fire Fighting, Jetting, Drainage, Oil Transfer

Immediate Delivery
New Equipment—Crated for Export

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REFINERY EQUIPMENT FOR SALE

One—3″ Pacific Hot Oil Pump, ten stage, direct connected to 600 H.P. 3 stage, G. E. Steam Turbine.
One—3″ Pacific Hot Oil Centrifugal Pump, seven stage, direct connected to 400 H.P. 3 stage, G. E. Steam Turbine.
One—30 x 7 x 20 Burnham Twin Simplex Hot Oil Pump.
1,975 Ft.—3¼ I.D. x 4½″ O.D. Tubing, 4-6 Chrome—in 25-ft. lengths, plain end.
One—Fractionating Tower, 6 ft. x 39 ft. x ⅜″ shell—20 steel bubble trays.
Two—5 ft. x 30 ft. Pressure Vessels, lined with lead and acid resisting brick.
Pressure vessels to 30,000 gals. capacity, Centrifugal and Reciprocating Pumps, Heat Exchangers, Valves.

PROCESS CONSTRUCTION CO., INC.
20700 So. Figueroa St. **Phone—Pleasant 26366**
Torrance, California **Los Angeles**

EQUIPMENT FOR SALE

NEW 200-A Sullivan Core Drill—Truck mounted. Box B-674, The Oil and Gas Journal, Tulsa, Oklahoma.

USED SHOT HOLE DRILLS
These drills are mounted on trucks and vary in size and in condition. May be seen at 8806 Lemmon Avenue, Dallas, Texas. Phone Dixon 4-2671.

OILFIELD TANDEM TRUCKS
Whites-International-Macks-Misc. full rigged for oilfield work or ideal for mounting heavy units or rigs. G. G. Clayton, Houston, Texas, P.O. Box 1671. Telephone Keystone 3-1361.

FOR SALE: Small topping plant, capacity 150 barrels per day; pipe line gathering system and crude available; storage tanks and trucks. Address inquiries to Box B-637, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1—14″ x 14″ Ideal horizontal twin cylinder steam drilling engine. 2—15½″ x 8½″ x 20″ Ideal steam slush pumps. Excellent condition. Priced right.
Lucey Products Corporation, Tulsa, Oklahoma.

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Brand New—On Original Reels
450,000 Ft. Hemp Center

254,400 ft.—¼″—6x7 High Grade Plow Steel Galv. Preformed.
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Aldridge Pump Co. Vertical Triplex HYDRAULIC PUMPS, 2¾″ x 8″, equipped with Herringbone gears, 67.5 GPM. Maximum pressure for intermittent duty 2,200 lbs., for continuous duty 1,800 lbs. Pump and motor mounted on common bed plate.

Motors are 75 HP, 3/60/220-440 volts, 1740 RPM. Complete with starting panel, consisting of G.E. motor starter switch, push button control, square "D" Switch, and capacitator.

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